151850

CONTRACTOR QUALITY CONTROL PLAN

SITE PREPARATION AND MATERIAL REMOVAL
ENVIRO-CHEM SUPERFUND SITE
ZIONSVILLE, INDIANA

Prepared For:

ENVIRONMENTAL CONSERVATION AND CHEMICAL CORPORATION TRUST

Prepared By:

AWD TECHNOLOGIES, INC.
PITTSBURGH, PENNSYLVANIA

AWD PROJECT NUMBER 9017.828

AUGUST 1993

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________

Date of Submittal:	08/12/93	Submittal Number	SPMR-034
Approval or Disapproval By:	__/__/__		
Previous Submittal Dates:	__/__/__	Resubmittal Number	-A
	__/__/__	Resubmittal Number	-B
	__/__/__	Resubmittal Number	-C
	__/__/__	Resubmittal Number	-D

Title of Submittal: Contractor Quality Control Plan
Manufacturer: ____________
Address: ____________

Supplier: ____________
Address: ____________

Specification Reference Number: 01400
Specification Reference Paragraph: ALL
Specification Reference Drawing Number: ——

Comments (additional space on back of this sheet)

Deviations (additional space on back of this sheet)

Certification Statement
By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data and I have checked and coordinated each item with other applicable reviewed shop drawings and all contract requirements.

Items Included	Check with "X"
Plan/Narrative	X
Shop Drawing(s)	
Catalog Cut/Mfgr Data	
Technical Data	
Test Report	
Certification	
Specifications	
Other:	

AWD Technologies, Inc.
Authorized Representative

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1.0 PROJECT DESCRIPTION

1.1 Site Location

The Enviro-Chem Superfund Site is located in a rural area of Boone County, about 5 miles north of Zionsville and 10 miles northwest of Indianapolis, Indiana (Figures 1-1 and 1-2).

1.2 Site Description

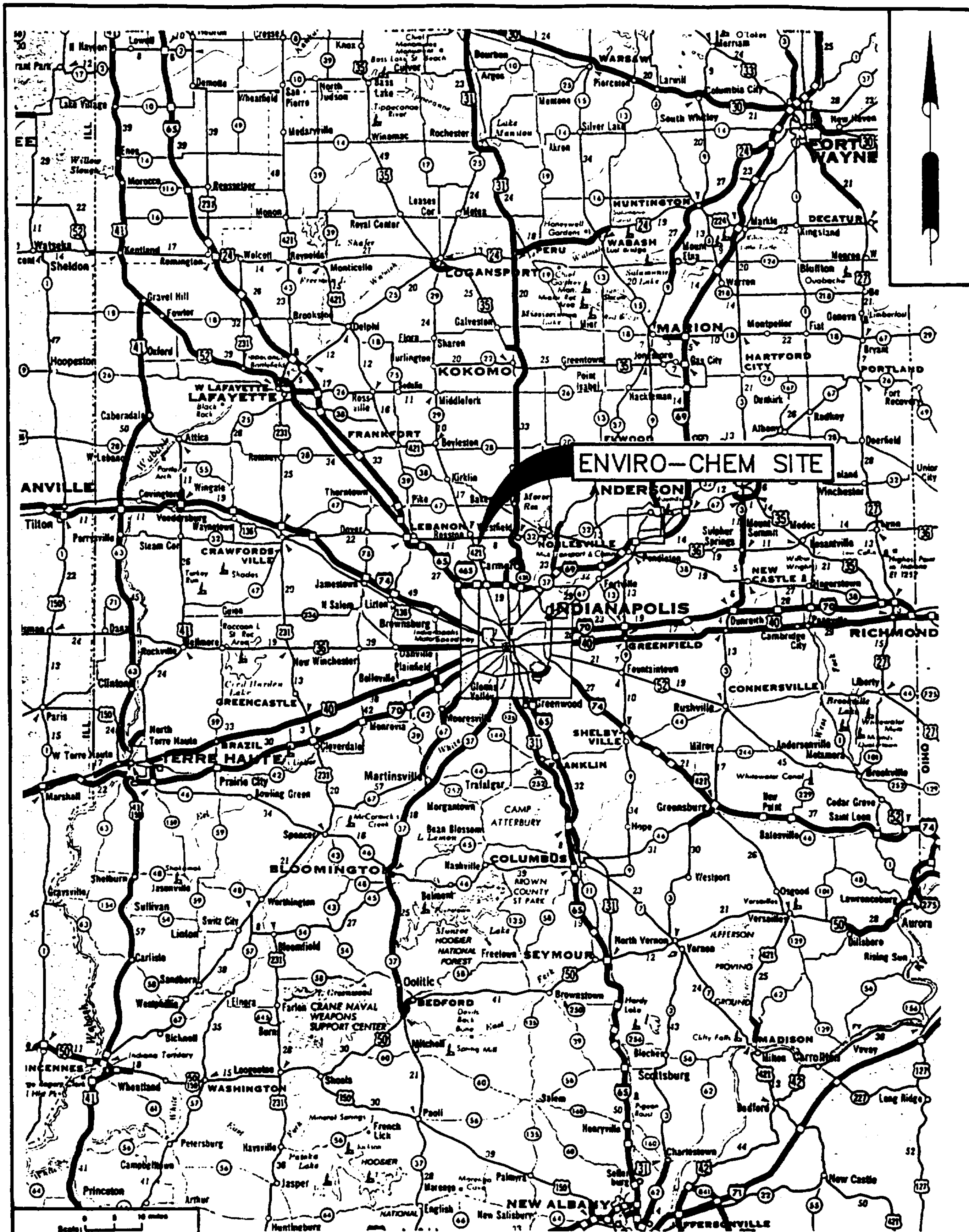
The Site is defined as the area bounded by the proposed perimeter fence, which includes the 3.053-acre remedial boundary, the support zone, and the buffer zone between the proposed fence and the north and eastern sides of the Site. A buffer zone on the southern side of the Site contains a proposed Remedial Contractor equipment laydown area.

Directly west of the Site is an active commercial waste handling and recycling facility operated by the Boone County Resource Recovery Systems, Inc. (BCRRS). Access to the Site will be from State Route 421 and will be shared with BCRRS.

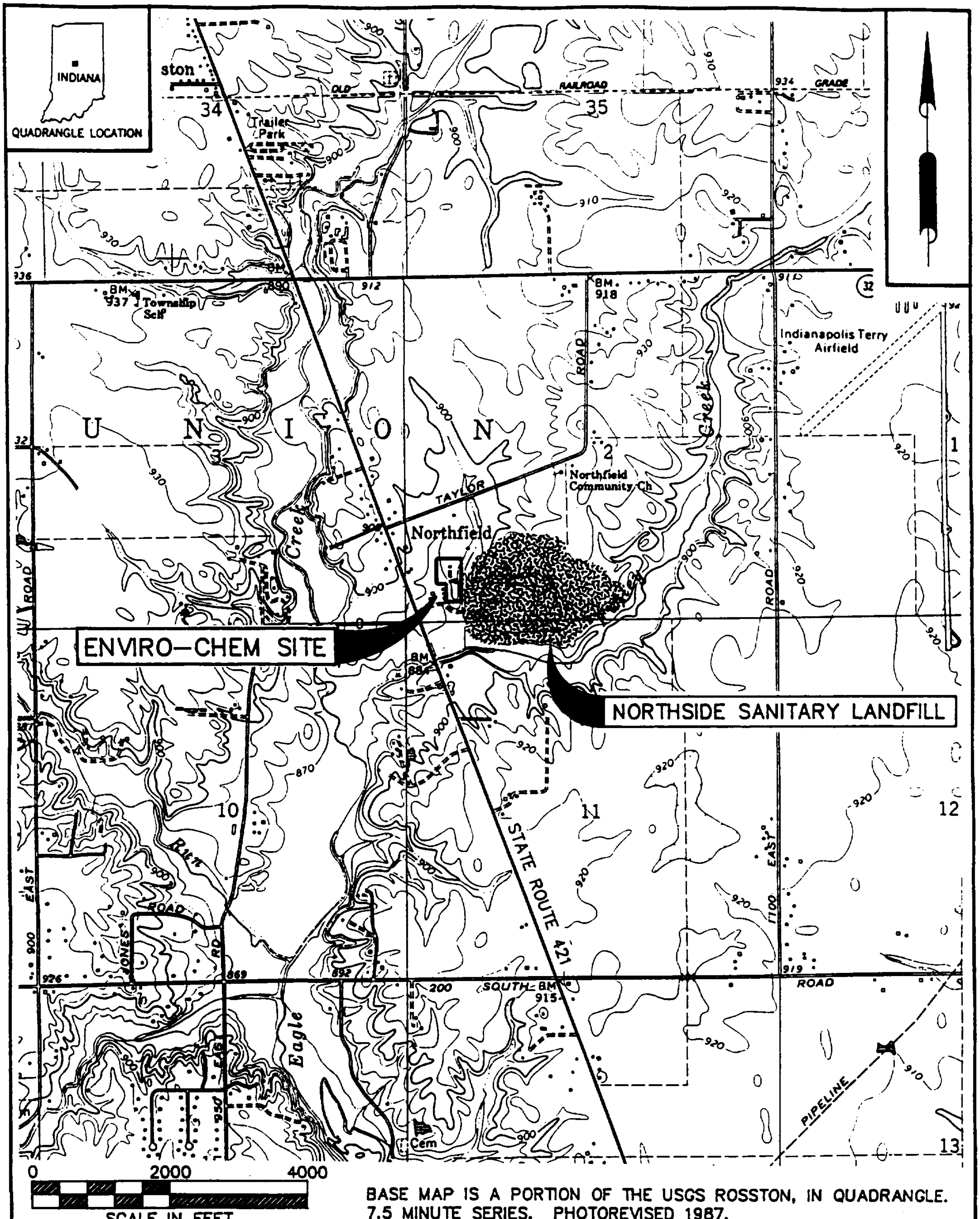
Directly east of the Site across an unnamed ditch is the inactive Northside Sanitary Landfill (NSL). This facility is also a Superfund Site and is presently undergoing remedial design activities. The south end of the Site is approximately 500 feet from an existing residence and is approximately 400 feet from Finley Creek, the main surface water drainage in the site area.

Residential properties are also located to the north and west, within 1/2 mile of the facilities. A small residential community, Northfield, is located north of the Site on State Route 421. Approximately 50 residences are located within 1 mile of the Site.

The Site is in an area that is gently sloping, predominantly to the east towards the unnamed ditch. The unnamed ditch runs north to south along the eastern edge of the Site and drains the Site either directly or from tributary ditches on the north and south ends of the Site. The unnamed ditch flows south from the Site to Finley Creek.



AWD TECHNOLOGIES, INC	SITE LOCATION MAP ENVIRO–CHEM SITE, ZIONSVILLE, IN
AWD TECHNOLOGIES	SCALE: AS SHOWN · FIGURE NUMBER 1–1 · REV 0



BASE MAP IS A PORTION OF THE USGS ROSSTON, IN QUADRANGLE. 7.5 MINUTE SERIES. PHOTOREVISED 1987.

AWD TECHNOLOGIES, INC	SITE MAP ENVIRO–CHEM SITE, ZIONSVILLE, IN		
	SCALE: AS SHOWN	FIGURE NUMBER 1–2	REV 0

Various solid waste materials are present at the Site both within the remedial boundary and within the support zone. Emergency actions undertaken prior to 1990 have resulted in the removal of the major sources of contamination. The structures remaining at the Site include cleaned tanks, the process building, the A-frame structure, the concrete pad with approximately 270 drums, and miscellaneous debris.

1.3 Summary of Work

The Enviro-Chem Trust has contracted AWD Technologies, Inc. (AWD) to perform site preparation and material removal work necessary for the remediation of the Enviro-Chem Superfund Site located in Zionsville, Indiana.

The site preparation phase of the work consists of the following items:

- Field surveying.
- Mobilization of Contractor equipment and personnel required for construction activities to the Site.
- Removal of the existing fence.
- Removal of the A-frame house.
- Installation of stormwater ditches, culverts, and temporary construction fence.
- Installation of new site security fence and gates as required for the support zone area.
- Grading, aggregate placement, access road, support zone, equipment laydown area, and parking area construction.
- Installation of decontamination pad and wastewater storage pad.

- Installation of temporary site facilities and utilities.

- Installation of exclusion zone fence.

The material removal phase of the work consists of the following items:

- Removal of tanks
- Removal of structures
- Removal of miscellaneous debris areas
- Removal of aboveground SVE pilot study area waste
- Removal of other site debris

2.0 CONTRACTOR QUALITY CONTROL PLAN OBJECTIVES

This Contractor Quality Control Plan (CQCP) has been prepared to meet the requirements of Section 01400 - CONTRACTOR QUALITY CONTROL of the Final Design Technical Specifications and the Final Design Construction Quality Assurance Plan. This CQCP describes the CQC system to be implemented by AWD to assure construction activities comply with the requirements of the contract plans, specifications, and drawings.

This CQCP addresses each component of the CQC system, including the project organization and responsibilities, quality control procedures, testing procedures, correction of deficiencies, and documentation/reporting requirements.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 Project Organization

Figure 3-1 presents the project organization chart which identifies areas of responsibility and lines of authority for the site preparation and material removal construction activities and indicates how personnel will interact.

3.2 Responsibilities

3.2.1 Remedial Contractor Project Manager

The Remedial Contractor Project Manager, Mr. Saverio F. DeBartolo, is responsible for overall management of the construction activities in accordance with the contract plans, specifications, and drawings. The Remedial Contractor Project Manager will also provide the necessary communications interface and reporting with the following principal organizations and personnel:

- Enviro-Chem Trust
- Enviro-Chem Trust's Engineer (Engineer)
- Remedial Design Engineer
- Remedial Contractor Resident Superintendent

The Remedial Contractor Project Manager will report directly to the Enviro-Chem Trust and/or their Engineer. Responsibilities of the Remedial Contractor Project Manager will include:

- Issue Final Certification of Completion Report

The Remedial Contractor Project Manager, in the performance of his duties, may require a staff of technical and administrative people that will report directly to him. The technical staff will provide the day-to-day technical backup as it relates to the construction activities.

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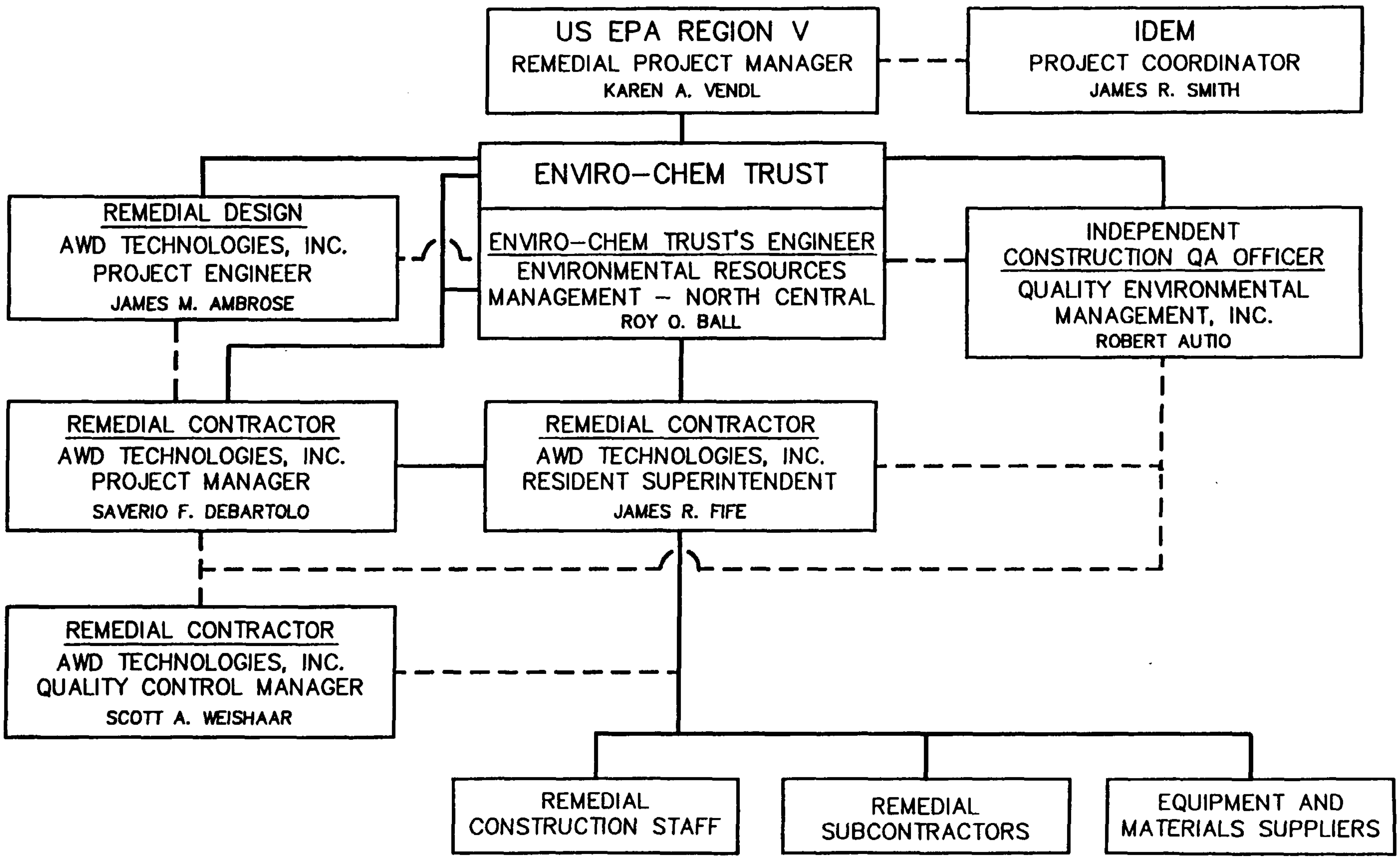

LEGEND

——— AUTHORITY

- - - - INTERACTION

AWD TECHNOLOGIES, INC

AWD TECHNOLOGIES

CONTRACTOR QC ORGANIZATION
SITE PREPARATION & MATERIAL REMOVAL
ENVIRO-CHEM SUPERFUND SITE ZIONSVILLE, IN

CLIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST | JOB NO. 9017-828

SCALE: NONE | FIGURE NUMBER 3-1 | REV 0

The administrative staff is necessary to perform day-to-day administrative functions. These administrative functions include such activities as:

- Tracking costs, invoices, and billing.
- Filing.
- Organization and filing of the documentation.

3.2.2 Remedial Contractor Resident Superintendent

The Remedial Contractor Resident Superintendent, Mr. James R. Fife, has the primary responsibility for day-to-day implementation of the project work in accordance with the contract plans, specifications, and drawings. The Remedial Contractor Resident Superintendent will retain the responsibility and authority to direct and manage his employees and the equipment used during construction. The Remedial Contractor Resident Superintendent will report directly to the Remedial Contractor Project Manager.

Responsibilities of the Remedial Contractor Resident Superintendent will include the following:

- Manage the daily performance of construction staff and oversee subcontractor activities
- Prepare Daily Reports
- Prepare Progress Reports
- Maintain Submittal Register
- Prepare Report of Field Changes
- Prepare Photographic Reporting Data Sheets
- Prepare Problem Identification and Corrective Actions Reports

3.2.3 Remedial Contractor Quality Control (CQC) Manager

The Remedial CQC Manager, Mr. Scott A. Weishaar, will be responsible for overall management of the project quality control and will have the authority to act in all CQC matters for AWD. The Remedial CQC Manager reports directly to the Remedial Contractor Project Manager for quality control purposes only. Responsibilities of the Remedial CQC Manager are outlined below:

- Coordination with the Independent CQA Officer.
- Manage the performance of all onsite and offsite inspections and testing.
- Review of the Remedial Design for clarity and completeness.
- Schedule and coordinate inspection activities.
- Perform observations and tests.
- Evaluate the results of the inspections and testing.
- Notify the Resident Superintendent of acceptance or rejection of the work and prepare the Non-Compliance Notifications, as necessary.
- Manage documentation of all inspections and testing, and notifications to the Resident Superintendent through Daily Quality Control Reports.
- Maintain project records.

In addition the CQC Manager will interact with remedial construction personnel in order to obtain required samples and to observe work procedures and practices and with equipment and material suppliers in order to assure delivery of that which was specified for construction in the Final Design Technical Specifications. The CQC Manager may also be required to interact with the Remedial Design Engineer and the Independent CQA Officer on construction related issues, and with regulatory authorities for concurrence on certain waste characterizations and disposal options.

A copy of the memorandum appointing Mr. Scott A. Weishaar to the position of Remedial CQC Manager is provided in Appendix A.

3.3 Personnel Qualifications

3.3.1 Remedial Contractor Project Manager

The Remedial Contractor Project Manager, Mr. Saverio F. DeBartolo, has demonstrated project management experience on various remediation projects. The qualifications for Mr. DeBartolo are provided in his resume which is presented in Appendix B.

3.3.2 Remedial Contractor Resident Superintendent

The Remedial Contractor Resident Superintendent, Mr. James R. Fife, has demonstrated experience in construction. He also possesses knowledge of waste handling and disposal requirements for both hazardous and nonhazardous materials. The qualifications of Mr. Fife are provided in his resume which is provided in Appendix B.

3.3.3 Remedial Contractor Quality Control (CQC) Manager

The Remedial CQC Manager, Mr. Scott. A. Weishaar, has demonstrated experience in field engineering and daily construction coordination. He also possesses sufficient practical technical and administrative experience to execute and record relevant quality control inspection activities for this project. The qualifications of Mr. Weishaar are provided in his resume which is provided in Appendix B.

4.0 QUALITY CONTROL PROCEDURES

The quality control procedures necessary to ensure conformance to the requirements of the contract plans, specifications, and drawings include proper scheduling and managing of all activities during construction; inspecting on a continuous basis each Definable Feature of Work; confirmatory blank and duplicate analytical testing; and review of all correspondence prior to submittal. The CQC system will employ the Three-Phased Inspection System for site activities, as described in the following paragraphs. All inspections will be made a matter of record in the CQC documentation.

4.1 Definable Features of Work

A Definable Feature of Work (DFW) is a portion of working consisting of materials, installation procedures, and supplies which are closely related to each other, which have the same control, and will be installed by the same work crew to completion. A DFW must be sufficiently small so that control of the work will be easily accomplished. The Three-Phased Inspection System will be employed for each DFW. The Definable Features of Work for this project consist of the following:

- Access Road and Support Zone Surfaces
- Decontamination Pad
- Wastewater Storage Pad
- Diversion Channels
- Fencing

4.2 Three-Phased Inspection System

4.2.1 Preparatory Inspection

The preparatory inspection will be performed prior to beginning any DFW. The preparatory inspection will include the following:

- Review of contract requirements
- Check to assure that all materials/equipment are available and have been tested
- Samples have been submitted and approved
- Check to assure that provisions have been made to do required control testing
- Examination of the work area to ascertain that all preliminary work has been completed
- Physical examination of materials and equipment and sample work to assure that they conform to submittal data

The Engineer, U.S. EPA, and IDEM will be notified at least 24 hours in advance of the preparatory inspection and prior to commencement of work. This phase of quality control will be repeated whenever a new crew works on the given activity of if substandard levels are evident from the preparatory inspection. All inspection results will be fully documented and made a matter of record.

4.2.2 Initial Inspection

The initial inspection will be performed as soon as a representative portion of a DFW has been accomplished. The initial inspection will include the following items:

- Examination of the quality of workmanship and materials
- Review of results of quality control testing

- Inspection for the use of defective or damaged materials and omissions
- Check of dimensional requirements

The Engineer, U.S. EPA, and IDEM will be notified at least 24 hours in advance of the initial inspection. All inspection results will be fully documented and made a matter of record.

4.2.3 Follow-Up Inspection

The follow-up inspection will be performed daily to ensure continuing compliance with contract requirements, including quality control testing, until completion of that particular DFW. A final follow-up inspection will be conducted and test deficiencies corrected prior to the final acceptance of Definable Features of Work. All inspection results will be fully documented and made a matter of record.

4.3 Completion Inspection

At the completion of a DFW, a completion inspection will be made to ensure that the feature of work is, in fact, completed and that all associated paperwork is current. A "punch list" of items which do not conform to the contract requirements will be prepared by the Remedial CQC Manager. The list will include the estimated date by which the deficiencies will be corrected. After correction of the "punch list" deficiencies, the Remedial CQC Manager will make a final completion inspection to ascertain that all "punch list" deficiencies have been corrected and so notify the Engineer.

4.4 Field Inspections

Field inspections of site activities will be a major segment of the CQC system. The inspections conducted will be in accordance with the Three-Phased Inspection System previously described. They will consist of observing site activities as well as reviewing project documentation.

Inspections will be conducted for all Definable Features of Work for adherence to the following:

- Scope of activities
- Appropriate sample collection and handling procedures
- Appropriate waste removal and handling procedures

- Completeness of task
- Documentation requirements

At a minimum, inspections for each DFW will consist of preparatory and initial inspections of the work activity, follow-up inspections, and a completion inspection when work is completed. All preparatory phase inspections will be repeated for each new work crew. Where deficiencies are apparent, inspection frequency will increase accordingly to assure conformance to contract requirements.

4.5 Sampling and Analysis Quality Control

In addition to inspection of the sampling activities, quality control for these items will include the following:

- Field prepared quality control samples consisting of field rinsate blank, trip blank, and duplicate samples.

- Laboratory QC procedures consisting of internal, duplicate, and surrogate spike samples.

- Independent data validation of laboratory results.

The field prepared QC samples will provide a check on both field and laboratory procedures. The trip blank sample will accompany the sample containers throughout the entire sampling episode and can indicate if the sample containers and packaging have been contaminated during the sampling process. The rinsate blank sample will consist of deionized water rinsed over field decontaminated sampling equipment to determine if the decontamination procedures between sample points is effective. Duplicate samples provide an indication of the reproducibility of laboratory results for nearly identical samples.

The laboratory QC samples will provide a check on the analysis of the samples. Data Quality Objective Level 3 acceptance levels will be applied to all spiked samples to determine their accuracy. Method blank samples will be analyzed to determine if laboratory procedures affect sample results.

Finally, the Remedial CQC Manager will conduct data validation independent of the laboratory in accordance with the Final Design Quality Assurance Project Plan. This will involve review of the following:

- Raw data
- Matrix spike recovery levels
- Blank and duplicate results
- Equipment calibration procedures

The validation task will result in data acceptance, rejection, or qualification.

4.6 Submittal Review

The Remedial CQC Manager will be responsible for certifying that all submittals are in compliance with the contract requirements, and are submitted according to the date indicated on the Remedial Contractor's submittal register. The Remedial CQC Manager is also responsible for physically checking materials and equipment needed for the various Definable Features of Work.

5.0 TESTING PROCEDURES

Inspection and test methods will be in accordance with the schedule in Table 5-1, which was compiled from the Final Design Construction Quality Assurance Plan. Construction element testing will be performed following recognized reference standards such as those published by the American Society of Testing and Materials (ASTM). A "test method reference" is indicated in Table 5-1 for each test.

The need for additional testing beyond the schedule included in Table 5-1 will be determined by the Remedial CQC Manager based on a detailed review of the quality of construction and test results. The testing information provided by suppliers may be verified by additional conformance testing if determined to be necessary by the Remedial CQC Manager based on the supplier's certification and on material inspection.

5.1 Field Tests

5.1.1 Geosynthetics Conformance Testing

5.1.1.1 Geomembranes

Upon arrival of geomembrane at the site, the Remedial CQC Manager will sample the rolls of geomembrane. The sampling frequency will be one sample per lot or one sample per 100,000 square feet, whichever is less. Samples will be taken across the entire width of the roll but not within the first 3 feet of the roll. Samples will be tested in accordance with the "test method reference" listed in Table 5-1.

5.1.1.2 Geotextiles

Upon arrival of geotextile at the site, the Remedial CQC Manager will sample the rolls of geotextile. The sampling frequency will be one sample per lot or one sample per 100,000 square feet, whichever is less. Sampling locations vary by test but not within the first 3 feet of the roll. The size of the sample will be 3 feet by width of roll. Samples will be tested in accordance with the "test method reference" listed in Table 5-1.

TABLE 5-1

INSPECTION AND TEST METHODS
PAGE 1 OF 5

Item	Inspection Method and Frequency	Test Method Reference
Access Road and Support Zone Surfaces		
Materials/Workmanship		
Suitable Fill	Observation (Verify Compliance to Design) - Daily	NA
	Grain Size Analyses - (1) Representative Borrow Area Sample Per Day for Confirmation of Specification	ASTM D422
Base Course (IDOH No. 2)	Observation (Verify Compliance to Design) - Daily	NA
	Supplier's Certificate - With First Shipment of Item	NA
Surface Course (IDOH No. 53)	Observation (Verify Compliance to Design) - Daily	NA
	Supplier's Certificate - With First Shipment of Item	NA
Geotextile	Observation (Verify Compliance to Design) - Daily	NA
	Apparent Opening Size	ASTM D4751
	Grab Strength	ASTM D4632
	Trapezoidal Tear Strength	ASTM D4533
	Puncture Strength	ASTM D4833
	Burst Strength	ASTM D3786
	Abrasion Resistance	ASTM D4157 and D4158
	Manufacturer's Certificate - At Time of Delivery of Item	NA

TABLE 5-1

INSPECTION AND TEST METHODS
PAGE 2 OF 5

Item	Inspection Method and Frequency	Test Method Reference
Decontamination Pad		
Materials		
Aggregate Subbase (4 inch IDOH No. 4)	Observation (Verify Compliance to Design) - Daily Supplier's Certificate - With First Shipment of Item	(Rolled and Approved Only) NA
Precast Concrete Sump	Observation (Verify Compliance to Design) - Daily Manufacturer's Certification for Strength, Air Content, Slump - of Item	NA ASTM C94 (by supplier)
Overflow Pipe (6 inch Schedule 80 PVC)	Observation (Verify Compliance to Design) - Daily Manufacturer's Certificate - At Time of Delivery of Item	NA NA
Cast Iron Grates, Lids, and Frames	Observation (Verify Compliance to Design) - Daily Manufacturer's Certificate - At Time of Delivery of Item	NA NA
Pressure Treated Lumber	Manufacturer's Certificate - At Time of Delivery of Item	NA
Geotextile Screen	Observation - Daily Manufacturer's Certification - At Time of Delivery of Item	NA NA
PVC Waterstops and Link-Seal	Manufacturer's Certification - At Time of Delivery of Item	NA

TABLE 5-1

INSPECTION AND TEST METHODS

Item	Inspection Method and Frequency	Test Method Reference
Workmanship		
Installation of Precast Manhole	Observation (Verify Compliance to Design) - Daily	NA
Overflow, Precast Manhole, and Trench Sump Connections	Observation (Verify Compliance to Design) - Daily	NA
Seals (Waterstops and Link-Seal)	Observation (Link-Seal Placement and Volume) - Daily	NA
Cast-in-Place Concrete	Observation (Verify Compliance to Design) - Daily	NA
	Slump - One Per Truckload	ASTM C143
	Compressive Strength - One Per Day of Pouring	ASTM C31
Formwork	Observation (Verify Compliance to Design) - Daily	NA
Wastewater Storage Pad		
Materials		
Pre-Fabricated HDPE Sump	Manufacturer's Certification - At Time of Delivery of Item	NA
Geomembrane (HDPE)	Manufacturer's Certification - At Time of Delivery of Item	NA
	Density	ASTM D1505
	Carbon Black Content	ASTM D1603
	Carbon Black Dispersion	ASTM D3015
	Thickness	ASTM D751
	Tensile Characteristics	ASTM D638
	Melt Flow Index	ASTM D1238

TABLE 5-1

INSPECTION AND TEST METHODS
PAGE 4 OF 5

Item	Inspection Method and Frequency	Test Method Reference
Perforated HDPE Pipe	Manufacturer's Certification - At Time of Delivery of Item	NA
Geotextile Fabric	Manufacturer's Certification - At Time of Delivery of Item	NA
Workmanship		
Cast-in-Place Concrete	Observation (Verify Compliance to Design) - Daily	NA
	Slump - One Per Truckload	ASTM C143
	Compressive Strength - One Per Day of Pouring	ASTM C31
Formwork	Observation (Verify Compliance to Design) - Daily	NA
Extrusion Welds (Pipe to Sump)	Observation (Verify Compliance to Design) - Daily	NA
Excavation and Anchor Trench	Observation (Verify Compliance to Design) - Daily	NA
Placement of Aggregates and Liner	Observation (Verify Compliance to Design) - Daily	NA
Geomembrane (HDPE)	Vacuum Testing	CQCP Section 5.1.2
	Air Pressure Testing	CQCP Section 5.1.2
	Destructive Seam Testing	CQCP Section 5.1.2
Geotextile	Observation (Verify Compliance to Design) - Daily	NA

TABLE 5-1

INSPECTION AND TEST METHODS
PAGE 5 OF 5

Item	Inspection Method and Frequency	Test Method Reference
Diversion Channels		
Materials		
Riprap	Observation (Verify Compliance to Design) - Daily	NA
	Supplier's Certificate - At Time of Delivery of Item	NA
Culverts (Reinforced Concrete Pipe)	Observation (Verify Compliance to Design) - Daily	NA
	Manufacturer's Certification - At Time of Delivery of Item	NA
Workmanship		
Trench Excavation	Measurement - Maximum Tolerance ± 0.20 Feet	NA
	Horizontal/Vertical - Daily	NA
Fencing		
Materials		
General Fencing	Observation (Verify Compliance to Design) - Daily	NA
	Manufacturer's Certification - At Time of Delivery of Item	NA
Gates	Observation (Verify Compliance to Design) - Daily	NA
	Manufacturer's Certification - At Time of Delivery of Item	NA
Workmanship		
Post Spacing and Placement	Observation (Verify Compliance with Survey) - Daily	NA
Gate Locations	Observation (Verify Compliance to Design) - Daily	NA

5.1.2 Geosynthetics Installation Testing

5.1.2.1 Geomembranes

Personnel performing seaming operations will be qualified by experience or by successfully passing seaming tests. At least one seamer will have experience seaming a minimum of 1,000,000 square feet of HDPE geomembrane using the same type of seaming equipment that is used at this site. AWD will provide the Engineer with a list of proposed seaming personnel and their professional records.

Test seams will be made on pieces of geomembrane liner to verify that seaming conditions are adequate. Test seams will be made at the beginning of each seaming period and at least once each 4 manhours (after lunch) for each seaming apparatus used that day. Each seamer will make at least one test seam each day.

Test seam samples will be at least 2 feet long and 1 foot wide with the seam centered lengthwise. Two adjoining specimens 1 inch wide will be cut from the test seam sample. These specimens will be tested in the field in shear and peel, respectively, by hand or tensiometer, and will not fail in the seam. If a team seam fails, the entire operation will be repeated. If the additional test seam fails, the seaming apparatus or seamer will not be accepted or be used for seaming until two consecutive successful test seams are achieved.

AWD will nondestructively test all field seams over their full length using a vacuum test unit or air pressure (fusion process). Testing will be done as the work progresses and not at the completion of all field seaming.

Locations where seams cannot be nondestructively tested will be observed by the Remedial CQC Manager for uniformity and completeness.

Vacuum testing procedures and requirements consist of the following:

- Vacuum testing will be conducted by utilizing a steel box with a clear-view glass top, a rubber gasket on the open bottom perimeter, a pressure gauge on the inside, and a vacuum hose connection to a steel vacuum tank and pump assembly equipped with a rubber pressure/vacuum hose with fittings and connections.

- The box will be placed over a seam section that has been thoroughly saturated with a soapy water solution. The rubber gasket on the bottom perimeter of the box must fit snugly against the soaped seam section of the liner.

- When 3 to 5 inches of vacuum is achieved, the seam will be inspected for pinholes, porosity, or nonbonded areas. Test time will be a minimum of 30 seconds per test section.

- If a void is detected, it will be properly marked for subsequent repairs.

Air pressure testing procedures and requirements are as follows:

- An air pump must be equipped with a pressure gauge capable of generating and sustaining 25 to 30 psi pressure, a hose, fittings and connections, and a sharp needle or approved alternate device.

- Seams must be sealed. The needle will be inserted in the cavity created by the fusion weld, apply 25 to 30 psi pressure for 5 minutes.

- The seam must be inspected for defects, pinholes, porosity, and nonbonded areas.

- If a void is detected, it will be marked and repaired.

Destructive seam testing will be performed as follows:

- Location and Frequency

    - No less than an average of one test must be conducted per 500 feet of seam length or per day whichever is greater.

    - Additional test locations will be determined during seaming at the Remedial CQC Manager's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.

- AWD will not be informed in advance of the locations where the seam samples will be taken.

- Sampling Procedures

  - Samples will be cut at locations designated by and under the observation of the Remedial CQC Manager in order to obtain laboratory test results prior to completion of liner installation. Each sample will be numbered and the sample number and location identified on the panel layout drawing.

  - Holes in the geomembrane resulting from destructive seam sampling will be immediately repaired. The new seams in the repaired area will be nondestructively tested.

- Size of Samples

  - Samples will be 12 inches wide by 38 inches long with the seam centered lengthwise. One 1-inch wide strip will be cut from each end of the sample, and these strips will be tested in the field, by hand or tensiometer, for shear and peel, respectively and will not fail in the seam. The remaining sample will be cut into three equal parts (minimum 12 inches each) and distributed as follows:

    -- One portion for the AWD's independent laboratory testing (12 inches by 12 inches).

    -- One portion for the Remedial CQC Manager for archive storage (12 inches by 12 inches).

- AWD's Laboratory Testing

  - Test results from the AWD's independent laboratory will be submitted to the Engineer as soon as they become available.

The cover material will be placed in such a manner to assure that the geotextiles are not damaged. Care will be taken to minimize any slippage of the geotextile and to assure that no tensile stress is induced in the materials.

5.1.3 Cast-In-Place Concrete Testing

All cast-in-place concrete will meet the requirements of Section 03300 - CAST-IN-PLACE CONCRETE of the Final Design Technical Specifications.

5.1.3.1 Slump

The Remedial CQC Manager will take a minimum of one slump test per truckload of concrete in accordance with ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete (Appendix D).

5.1.3.2 Compressive Strength

The Remedial CQC Manager will take a minimum of one set of compressive strength specimens (cylinders) per day of pouring concrete in accordance with ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field (Appendix D).

6.0 NON-COMPLIANCE NOTIFICATIONS AND CORRECTION OF DEFICIENCIES

6.1 Non-Compliance Notifications

In the event that problems are encountered and corrective actions are taken to alleviate the problems, non-compliance notifications will be prepared by the Remedial CQC Manager with concurrence by the Remedial Contractor Resident Superintendent.

6.2 Field Deficiencies

All deficiencies will be reported to the Remedial Contractor Resident Superintendent and the Remedial CQC Manager. If a deficiency cannot be resolved upon its identification, it will be the responsibility of the Remedial Contractor Resident Superintendent and Remedial CQC Manager to implement a corrective procedure in a timely manner. When a corrective remedy is implemented, follow-up inspections will be conducted to determine its effectiveness.

All field deficiencies will be documented in the Daily Quality Control Report by the Remedial CQC Manager. Ongoing deficiencies will also be placed on the List of Outstanding Deficiencies which will be an addendum to the Daily Quality Control Report. As deficiencies are corrected, they will be acknowledged in the Daily Quality Control Report and deleted from the list. All necessary corrective actions will be fully documented in the Daily Quality Control Report. In addition, the Remedial Contractor Resident Superintendent will prepare a Problem Identification and Corrective Actions Report for any field deficiencies.

6.3 Laboratory Deficiencies

Corrective actions for the laboratory analytical work will be consistent with the laboratory's internal quality control program. The laboratory will provide documentation as to what, if any, corrective actions were initiated.

Anomalous events, from sample receipt through report delivery, that are contrary to good laboratory practice and/or the requirements of the laboratory quality assurance program are out-of-control events. The treatment of these events is outlined through the examples that follow.

6.3.1 Corrective Action During Check-In

The sample custodian checks the samples, field duplicates, trip, and rinsate blanks against the shipping document or field chain of custody. If discrepancies exist, the sample custodian will document them and notify the Remedial Contractor Resident Superintendent. The Remedial Contractor Resident Superintendent will then notify the Remedial CQC Manager and attempt to resolve the discrepancies. All communication is documented.

6.3.2 Corrective Action During Analysis

Prior to and during sample analysis, the analyst monitors the analytical system to ensure that the elements crucial to producing data of acceptable quality (tune, initial calibration, calibration verification, method blank results, results or matrix spike/matrix duplicate analyses, etc.) meet the specified criteria. If a criterion is not met, the analyst takes the appropriate corrective action and documents the event on an analysis log and that the corrective action taken was appropriate and sufficient. If the corrective action taken by the analyst was satisfactory, the Laboratory Manager approves the data. If the corrective action was insufficient, the Laboratory Manager indicates this in the analysis log and directs the additional corrective action. The additional corrective actions are also documented on the analyst's log.

6.3.3 Corrective Action During Data Review

The Laboratory Manager reviews data for complete analyses daily, double-checking identification and quantitation of target parameters, and ensuring that quality control checks are made at the appropriate frequency and that they meet the specified criteria. If a problem is found during review, the Laboratory Manager indicates same in the analysis log and directs the appropriate corrective action.

7.0 DOCUMENTATION/REPORTING REQUIREMENTS

The reporting requirements for the CQC system consist of the following:

- Inspection Reports (Appendix C)
  - Daily Quality Control Report
    - Geomembrane Trial Weld Report
    - Geomembrane Panel Placement QC Checklist
    - Geomembrane Panel Seaming QC Checklist
    - Geomembrane Seam Testing QC Checklist
    - Geomembrane Field Destructive Test Log
    - Geomembrane Repair Log
  - Preparatory/Initial/Follow-Up Inspection Report
  - Final Certification of Completion Report
  - QC Test Report List
  - List of Outstanding Deficiencies
  - Non-Compliance Notification
  - Problem Identification and Corrective Actions Report
- Submittal Register (Appendix C)
- Resident Superintendent's Daily Report (Appendix C)
- Report of Field Change (Appendix C)
- Transmittal Form (Appendix C)
- Photographic Reporting Data Sheet (Appendix C)
- Resident Superintendent's Progress Report (Appendix C)
- Manifest Report Forms
- Remedial Contractor Mark-Up Drawings
- Final CQC Report

7.1 <u>Inspection Reports</u>

The inspection reports for this project are to document the progress and effort of the ongoing construction activities.

7.1.1 Daily Quality Control Report

Daily Quality Control Reports will be prepared to document inspections and field tests during construction activities. Appended to these reports will be recorded pertinent observations in the form of notes, charts, sketches, photographs, or any combination of these. The original (or copy) will be filed by the Remedial CQC Manager with copies sent to the Remedial Contractor Resident Superintendent and the Independent CQA Officer.

A Daily Quality Control Report will be prepared that summarizes all visual observations and inspections and materials testing and inspections performed for work items completed daily.

Specific geomembrane materials and workmanship reports will be attached to the Daily Quality Control Report. These will include the following:

- Geomembrane Trial Weld Report
- Geomembrane Panel Placement QC Checklist
- Geomembrane Panel Seaming QC Checklist
- Geomembrane Seam Testing QC Checklist
- Geomembrane Field Destructive Test Log
- Geomembrane Repair Log

7.1.2 Preparatory/Initial/Follow-Up Inspection Report

The Preparatory/Initial/Follow-Up Inspection Report will be completed by the Remedial CQC Manager as inspections are performed for each DFW. The Preparatory/Initial/Follow-Up Inspection Report will be attached to the Daily Quality Control Report.

7.1.3 Final Certification of Completion Report

The Final Certification of Completion Report will be prepared by the Remedial CQC Manager and signed by the Remedial Contractor Project Manager. The Final Certification of Completion Report will be attached to the Daily Quality Control Report.

7.1.4 QC Test Report List

The QC Test Report List will be completed by the Remedial CQC Manager to document date, type, and result of all QC testing performed. The QC Test Report List will be an addendum to the Daily Quality Control Report.

7.1.5 List of Outstanding Deficiencies

The List of Outstanding Deficiencies will be completed by the Remedial CQC Manager to document any ongoing deficiencies. As deficiencies are corrected, they will be deleted from the list. The List of Outstanding Deficiencies will be an addendum to the Daily Quality Control Report.

7.1.6 Non-Compliance Notifications

Non-Compliance Notifications will be prepared to document any problems encountered and the corrective measures taken to alleviate such problems. The problems may relate to materials or workmanship that does not meet contract requirements. Notifications will be prepared as necessary by the Remedial CQC Manager with concurrence by the Remedial Contractor Resident Superintendent. The original will be filed by the Remedial CQC Manager with copies sent to the Independent CQA Officer and the Engineer. Non-Compliance Notifications will be an addendum to the Daily Quality Control Report.

7.1.7 Problem Identification and Corrective Actions Report

The Problem Identification and Corrective Actions Report will be prepared by the Remedial Contractor Resident Superintendent. These reports will state the problem and proposed corrective actions to be implemented to correct the problem. The Problem Identification and Corrective Actions Reports will be an addendum to the Daily Quality Control Report.

7.2 Submittal Register

The Submittal Register provides a record of all submittals and transmittals related to materials and construction. Examples of items to be recorded include construction drawings, shop drawings, samples, equipment and materials, certifications, and test data. The Remedial

Contractor Resident Superintendent will maintain this record, numbered sequentially, and will send copies to the Independent CQA Officer, the Remedial Design Project Engineer, the Remedial CQC Manager, and the Engineer on an as-needed basis.

7.3 Resident Superintendent's Daily Report

The Resident Superintendent's Daily Report will be prepared by the Remedial Contractor Resident Superintendent. This report is a summary of the day's construction activities which includes:

- Data on weather conditions
- Reports of all meetings held and their results
- Description and location of work areas
- Description of offsite materials received
- Decisions made regarding approval of materials or work done and/or corrective actions to be taken in instances of substandard quality

All of the daily inspection data sheets will be numbered sequentially and attached to this report. The originals will be filed with the Remedial Contractor Resident Superintendent and copies sent to the Independent CQA Officer and the Engineer. A permanent and complete record of this information will be kept at the project site.

7.4 Report of Field Change

A report indicating changes to the originally specified construction will be prepared by the Remedial Contractor Resident Superintendent which will describe, in detail, the recommended change or changes that are made. Indication will be made as to whether this is an isolated case or general condition which will affect or change additional work or future plans, specifications, and/or drawings. Changes to basic design or major changes require concurrence between parties. The original will be filed by the Remedial CQC Manager with copies sent to the Independent CQA Officer, the Engineer, and the Remedial Design Project Engineer.

7.5 Transmittal Form

A standard transmittal form will be used when submitting any type of QC documentation (e.g., report, request, manufacturers/suppliers certifications, shop drawing, etc.).

7.6 Submittal Form

The Remedial Contractor Resident Superintendent will complete a Submittal Form for each submittal. The submittal forms will be numbered sequentially and recorded on the submittal register. A permanent and complete record of submittal forms will be kept at the project site along with the submittal register.

7.7 Photographic Reporting Data Sheet

A pictorial record of the work progress, problems, and corrective measures will be handled through photographic documentation generated during construction and controlled by the Remedial Contractor Resident Superintendent. Photographs will be identified as to the roll number, the frame number, the date, and the project. Photographs will document in-progress work or completed physical components. A description will be included of pertinent objects in the photograph identified and recorded. The negatives will be filed in the order taken and stored separately from the photographs. A data sheet, numbered sequentially, will be prepared by the Remedial Contractor Resident Superintendent, with copies to the Independent CQA Officer, the Remedial Design Project Engineer, and the Engineer. Two additional prints of photographs will be obtained, one set for the Remedial Design Project Engineer and one set for the Engineer.

7.8 Resident Superintendent's Progress Report

The Remedial Contractor Resident Superintendent will prepare a monthly progress report at submittal dates established at the Pre-Construction Conference and submit it to the Remedial Contractor Project Manager and the Engineer. This report will include the following information:

- A unique identifying sheet number for cross-referencing and document control.
- The date, project name, location, and other information.
- A summary of work activities during progress reporting period.

- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period.
- A summary of test results, failures and retests.
- The signature of the Remedial CQC Manager.

7.9 Manifest Report Forms

All manifest reports for transported wastes will be reviewed by the Remedial CQC Manager for completeness and accuracy prior to offsite shipment. The Remedial CQC Manager will maintain a copy of each manifest at the jobsite during the entire project.

7.10 Remedial Contractor Mark-Up Drawings

The Remedial Contractor Resident Superintendent will be responsible for mark-ups to the Contract Drawings during construction activities. These mark-ups will include all modifications to the Contract Drawings. The Remedial CQC Manager will ensure that all necessary mark-ups have been made to the Contract Drawings. At the completion of this project, the Mark-Up Drawings will be submitted to the Engineer.

7.11 Final CQC Report

The Remedial CQC Manager will prepare a Final CQC Report at the completion of this project. The report will summarize all CQC information, and it will include all CQC data generated during the project.

APPENDIX A

MEMORANDUM APPOINTING REMEDIAL CQC MANAGER

AWD TECHNOLOGIES

Memorandum

PGH-93-SFD-928

TO: Scott A. Weishaar **DATE:** August 9, 1993

FROM: Saverio F. DeBartolo **COPIES:** James R. Fife

SUBJECT: Contractor Quality Control - Enviro-Chem Superfund Site

You have been appointed the Remedial Contractor Quality Control (CQC) Manager for the above referenced project.

Your duties have been outlined in the Final Design Documents and the Contractor Quality Control Plan. These duties, briefly reiterated below, include but are not limited to the following:

- Coordination with the Independent CQA Officer.
- Manage the performance of all onsite and offsite inspections and testing.
- Review of the Remedial Design for clarity and completeness.
- Schedule and coordinate inspection activities.
- Perform observations and tests.
- Evaluate the results of the inspections and testing.
- Notify the Resident Superintendent of acceptance or rejection of the work and prepare the Non-Compliance Notifications, as necessary.
- Manage documentation of all inspections and testing, and notifications to the Resident Superintendent through Daily Quality Control Reports.
- Maintain project records.

In addition, be advised that you possess the responsibility, the obligation, and the full authority to order the Remedial Contractor Resident Superintendent to suspend work for which the standards established by the contract plans, specifications, and/or drawings for the performance of the work are not being met and maintained.

In conclusion, please be aware that the evaluation of AWD's performance on this project will be governed, in large part, by your actions and efforts. As Remedial CQC Manager, it is therefore up to you to ensure that we provide U.S. EPA and IDEM with a safe, quality project; one that we can all be proud of.

Thank you.

SFD/drp

APPENDIX B

PERSONNEL QUALIFICATIONS

SCOTT A. WEISHAAR

EDUCATION

Purdue University, B.S., Civil Engineering, 1992

PROFESSIONAL HISTORY

AWD Technologies, Inc., Staff Engineer, 1993-Present
Indianapolis Department of Public Works, Facilities/Drainage Engineer, 1992
Indianapolis Department of Public Works, Flood Control Engineer, 1991
Schneider Engineering Corporation, Land Surveyor, 1989-1990

REPRESENTATIVE EXPERIENCE

As a staff engineer, Mr. Weishaar provides engineering support to various types of environmental projects, including remedial actions and UST closure and removal projects. Other activities include site investigation planning, feasibility studies, and cost estimating. A partial listing of relevant project experience includes:

- Field engineer assisting in the preparation and implementation of work package specifications, including coordination of daily construction activities with the contractor for an underground storage tank removal project in Clinton, Indiana. Also performed field soil sampling and screening analyses for both volatile and semivolatile organic compounds during underground storage tank removal operations.

- Site engineer assisting in the removal of three unregulated underground storage tanks in Colorado City, Texas. Also performed field soil sampling and air monitoring within the breathing zone during underground storage tank removal operations and tank cleaning operations.

- Staff engineer assisting in the preparation of plans and specifications for a wastewater discharge project in Peru, Indiana. Also performed feasibility study and cost estimating for project alternatives.

- Staff engineer assisting in the preparation of bid documents and site remediation for an underground storage tank removal project in Indianapolis, Indiana.

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers
Air and Waste Management Society

JAMES R. FIFE

EDUCATION

University of Pittsburgh, B.S., Business Management, 1983
Educational Institute of Pittsburgh, Design Drafting, 1970

PROFESSIONAL HISTORY

AWD Technologies, Inc., Project Manager, 1991-Present
OHM Corporation, Manager Project Development, 1990-1991
Belcan Corporation, Senior Cost Estimator/Project Planner, 1989-1990
OHM Corporation, Project Estimator/Manager, 1988-1989
IT Corporation, Senior Project Estimator, 1986-1988
PPG Industries, Senior Project Estimator/Project Engineer, 1980-1988
Dravo Corporation, Senior Project Estimator, 1972-1980

REPRESENTATIVE EXPERIENCE

Project Manager responsible for cost and schedule of all assigned remediation projects to $5 million. Established the estimating and scheduling programs and controls.

<u>OHM Corporation</u>

- Responsible for bid decisions, proposal team assignments, technical coordination, estimate, and proposal review for all private planned environmental remediation proposals.

- Managed the project development staff consisting of 7 estimators, 5 technical writers, and 4 word processors and coordinated the efforts of an auxiliary technical engineering staff.

<u>Belcan Corporation</u>

- Developed, implemented, and used the Lotus 123 based construction cost estimating system to prepare all detailed capital estimates for eight regional E.I. DuPont chemical and fibers manufacturing facilities and implemented Primavera Project Planner to schedule and coordinate design, procurement, and construction efforts.

OHM Corporation

- Developed estimates, schedules, proposal text, and provided project setup and field supervision for all assigned remediation projects.

- Responsible for direct field supervision of the decontamination and dismantlement of a lead additive facility owned by a major U.S. chemical producer.

IT Corporation

- Developed estimates, schedules, proposal text, and provided project setup and field supervision for all assigned remediation projects including landfills, facility decontamination, and asbestos abatement.

- Directed the integration of a Dbase III+, Lotus 123, and Primavera Project Planner based estimating system for project development.

PPG Industries

- Prepared detailed discipline construction estimates to $10 million at PPG's largest chemical manufacturing facility.

- Developed and implemented a Lotus 123 based estimating system which standardized the plant estimating format and resulted in an overall improvement in estimate preparation time and accuracy.

- Managed design, procurement, and construction activities for a $10 million Caustic building and process renovation and presented project status to management.

Dravo Corporation

- Developed estimates for all disciplines including piping, civil/structural, process controls, HVAC, etc. for heavy industrial projects ranging from $10 to $200 million.

- Developed field estimates and cost reports and trained a native estimator for a $10 million retrofit project in Indonesia.

SAVERIO F. DEBARTOLO

EDUCATION

Duquesne University, B.S., Education Sciences, 1975

PROFESSIONAL HISTORY

AWD Technologies, Inc., Director of Remedial Services, 1991-Present
OHM Remediation Services Corporation, 1988-1991
- Project Development Director, Midwest Region
- Product Development Manager, Corporate
- Product Manager II, Corporate
- Project Manager III, Midwest Region

International Technology Corporation, 1985-1988
- Project Development Manager, Remediation
- Project Manager, Remediation

Conversion Systems, Inc. 1979-1985
- Senior Technical Advisor
- Operations Supervisor

F.B.B. Construction, Inc., 1975-1979
- Superintendent
- Supervisor
- Foreman

REPRESENTATIVE EXPERIENCE

As Director, Remedial Services, is responsible for the development of a remediation business unit, including staffing, business development, and senior project management. Additional responsibilities involve development of field remediation management control systems and the associated cost estimating support.

Mr. DeBartolo joined OHM in 1988 with 16 years previous experience in environmental waste management and construction management. As OHM's Midwest Regional Project Development Director, he provided supervision and guidance to the Region's proposal managers, cost estimators, and technical editors, who support seven operational divisions servicing an 18-state area. His specific responsibilities included evaluation of new project opportunities, development of proposals and estimates, final scoping and pricing reviews, client communications, and contract negotiations.

The typical projects developed in this department are identified as follows: surficial drum removal, drum excavation, pit/pond/lagoon, facility/equipment decontamination, laboratory pack handling, main laboratory analytical, field laboratory analytical, site sampling, hydrogeological investigation, MUST program (including testing, upgrading, removing, and replacing underground/aboveground storage tanks, consulting/engineering, mobile treatment, design/construct, groundwater recovery and treatment, transportation and disposal, soil excavation, equipment/supply rental and sales, explosives handling, radioactive material handing, emergency response, bench/pilot scale studies, methodology development, RCRA site closure, remedial investigation/feasibility study, biological treatment, aquifer restoration, waste site cleanup, facility demolition, site assessment, plant closure, dewatering, surface impoundment restoration, thermal destruction (incineration and soil volatilization), onsite treatment, biodegradation, and asbestos abatement.

Prior to joining the Midwest Region, Mr. DeBartolo served as Corporate Product Development Manager. His responsibilities included marketing and development of OHM's Tank Management Services for the Northeast, Midwest, Southern, and Western Regions. Tank management services include site assessment, removal, abandonment, upgrade, replacement, tightness testing, cleaning, filtering, soil and groundwater remediation, as well as all other remedial actions required to bring underground and aboveground storage tanks into compliance with today's U.S. EPA regulations.

In the role of project manager, Mr. DeBartolo has provided full-scale management of complex multidisciplinary projects to ensure project completions occur on schedule, within cost, and meet contractual compliance. He has used his knowledge of project management and the heavy-construction industry to provide technical and practical assistance on a wide variety of hazardous waste remediation projects including facilities decontamination and dismantlement, hazardous waste pumping/piping systems, contaminated sludge and soils excavation, absorption (pugmill and in-situ), impoundment and waste-cell construction, geosynthetic-liner installations, large earthwork projects, emergency response, and tank management services. These projects have required Mr. DeBartolo's oversight of such issues as health and safety, QA/QC, field laboratories, labor relations, and engineered-project controls. The following are representative projects for which Mr. DeBartolo was the project manager:

- Decontamination and Dismantlement of a Tetraethyllead (TEL) Manufacturing Complex - The decontamination operations included asbestos abatement: neutralization of TEL sludge and sodium; decontamination of PCBs and diphenol-contaminated transformers, switch gear and vessels; ethylene dibromide decontamination; and demolition of chromium-contaminated concrete. Dismantlement of the complex included both hot- and cold-cutting techniques and demolition of structures by wrecking ball and demolition tractors.

- Closure of Four Impoundments and the Construction of an Interceptor Trench - Impoundment-closure activities at a site contaminated with chromium and many other heavy metals included evacuation of liquid and sludge in the impoundments, decontamination, and removal of liners, decontamination and milling of asphalt pads and the installation of a cap and moisture-barrier system. Interceptor-trench activities included dewatering of a deep-trench interceptor and installation of a leachate-collection system.

- Construction management of a Class I hazardous waste landfill cell - Imperial Valley, California.

- Upgrade of an Existing Emergency Holding Basin - The basin contained RCRA-regulated hazardous waste; chemical constituents included acetone, chlorobenzene, dimethylsulfoxide, toluene, and xylene. Remedial action plan included the excavation, loadout, and transportation of contaminated materials from the holding basin and the preparation of subgrade for a liner.

- Removal of Numerous Underground Storage Tanks - Projects involved both leaking and nonleaking tanks and required permitting, removal of tank product, triple-rinsing of tank and ancillary piping, displacement of the atmosphere by a nonreactive gas, excavation of soil surrounding tank, removal and demolition or disposal of tank, collection, and analysis of soil samples, excavation and disposal of contaminated soil, installation of new tank and piping, and site restoration.

- Site Remediation and Construction of a Capping System - The site was a deposit area for sludges contaminated with heavy-metal hydroxides including cadmium, chromium, and cyanides. The remedial action plan required removal of sludge from a wetlands area and tidal flats and stockpiling of excavated sludge on site. The sludge was then capped with a PVC liner and soil. Additional site activities included the rehabilitation of the wetlands area and reinforcement of the side of the cap which borders a river.

- Various Phases of Decommissioning an Electroplating Facility -The primary health hazards of the site were cyanides and heavy-metals contamination. An investigation of the electroplating building included collection of soil samples at controlled locations and depths, collection of samples of debris from the duct system and analyses of soil and debris samples to determine the extent of contamination. An investigation was also conducted of soil beneath an asphalt lot.

SPECIALIZED TRAINING

OSHA 40-Hour Safety Training
OSHA HAZWOPER Refresher Training
OSHA HAZWOPER Supervisory Training
Project Manager Training

CERTIFICATIONS

Operating Engineer

APPENDIX C

CQC REPORT FORMS

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Date: ______________

Weather: ____

____

____

____

Work Performed: ____

____

____

____

____

____

____

____

____

____

____

____

____

____

____

Date: ________________

Material/Equipment Delivered (Identify Supplier and Quantity):

____

____

Results of Inspections (See Attached Inspection Report): ____________________________

____

____

Results of Testing (See Attached Testing Report): ________________________________

____

____

____

____

Verbal Instructions and/or Comments: ______________________________________

____

____

____

Remarks (Including Deficiencies/Corrective Actions): ____________________________

____

____

____

CERTIFICATION: I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and have determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications except as may be noted above.

______________________________ ______________________________

Signature Date

Distribution: 1. Resident Superintendent
2. Independent CQA Officer

GEOMEMBRANE TRIAL WELD REPORT

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Date: ______________

Prepared By: ____________________ Device No.: ____________________

Material Type: ____________________ Seamer ID: ____________________

Thickness: ____________________ Seam Type: ____________________

	Sample ID No.	Specimen	Peel Adhesion	Bonded Seam Strength	Weather Conditions
	____________	1	____________	____________	Temp: ____________
		2	____________	____________	Wind: ____________
				Device Temp: ________	General: ____________
Tested By: ________				Preheat: ____________	____________
Monitor: ________		Time:	____________	Speed: ____________	Location: ____________
	____________	1	____________	____________	Temp: ____________
		2	____________	____________	Wind: ____________
				Device Temp: ________	General: ____________
Tested By: ________				Preheat: ____________	____________
Monitor: ________		Time:	____________	Speed: ____________	Location: ____________
Notes:					

GEOMEMBRANE PANEL PLACEMENT
QUALITY CONTROL CHECKLIST
PAGE _____ OF _____

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ________________________

Date: ____________

Date/Time	Panel No.	Mfg. Roll No.	Panel Length	Panel Width	Overlap	Temporary Loading	Subbase Condition	Monitor	Comments

GEOMEMBRANE PANEL SEAMING
QUALITY CONTROL CHECKLIST
PAGE ____ OF ____

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ______________________

Date: ______________

Date Seamed	Start Time	Finish Time	Seam No.	Panel No.	Seam Length	Seamer ID	Device No.	Temp. Setting	Destruct Sample ID	Destruct Sample Loc	Comments

GEOMEMBRANE SEAM TESTING
QUALITY CONTROL CHECKLIST
PAGE _____ OF _____

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ______________________

Date: _______________

Seam No.	Date Tested	Start Time	Finish Time	Initial Pressure	Final Pressure	Monitor ID	Tester ID	Vacuum Test	Results P/F	Verification of Repairs	Comments

GEOMEMBRANE FIELD DESTRUCTIVE TEST LOG
________________________ LINER
PAGE ____ OF ____

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ______________________

Date: _____________

Sample No.	Seam No.	Panel No.	Date Welded	Field Test Inspector	Date Field Tested	Field Test Results	Remarks

GEOMEMBRANE REPAIR LOG
PAGE ____ OF ____

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Date: ____________

Location	Description of Damage	Repair Type	Non-Destructive Testing
Panel No.: ________ Seam No.: ________ Welder ID: ________ Date Repaired: ______			Date: ________ Test Type: ________ Outcome: ________ Monitor ID: ________
Panel No.: ________ Seam No.: ________ Welder ID: ________ Date Repaired: ______			Date: ________ Test Type: ________ Outcome: ________ Monitor ID: ________
Panel No.: ________ Seam No.: ________ Welder ID: ________ Date Repaired: ______			Date: ________ Test Type: ________ Outcome: ________ Monitor ID: ________
Panel No.: ________ Seam No.: ________ Welder ID: ________ Date Repaired: ______			Date: ________ Test Type: ________ Outcome: ________ Monitor ID: ________
Panel No.: ________ Seam No.: ________ Welder ID: ________ Date Repaired: ______			Date: ________ Test Type: ________ Outcome: ________ Monitor ID: ________
Panel No.: ________ Seam No.: ________ Welder ID: ________ Date Repaired: ______			Date: ________ Test Type: ________ Outcome: ________ Monitor ID: ________
Panel No.: ________ Seam No.: ________ Welder ID: ________ Date Repaired: ______			Date: ________ Test Type: ________ Outcome: ________ Monitor ID: ________

PREPARATORY/INITIAL/FOLLOW-UP INSPECTION REPORT

Date:_______________

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER _____________________

Technical Specification/ Drawing Reference	Type Inspection ("P"/"I"/"F")	Definable Feature of Work	Date Performed	Results	Names of Attendees/Remarks

FINAL CERTIFICATION OF COMPLETION REPORT

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Definable Feature of Work:

____
____
____
____
____
____

Including major equipment, material, and/or services:

____
____
____
____
____
____
____
____

Was accepted/inspected on ________________ by ______________________________.

Accordingly, ________________________ certifies all work is completed, with the exception of items listed in attached "punch list", in accordance with the project design documents, and all applicable inspections and construction tests have been satisfactorily completed.

______________________________ ______________________________
Scott A. Weishaar (Date)
Remedial CQC Manager

______________________________ ______________________________
Saverio F. DeBartolo (Date)
Remedial Contractor Project Manager

QC TEST REPORT LIST

Date:________________

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ______________________

Technical Specification/ Drawing Reference	Type of Test	Date Performed	Results	Remarks

Page ____ of ____

LIST OF OUTSTANDING DEFICIENCIES

Date:________________

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ______________________

Construction/Approval Drawing Reference	Location	Description of Deficiency	Date Found	Date to be Corrected	Date Corrected	Remarks

Page _____ of _____

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

To: ____

Date: ________ Time (AM/PM): ________ Inspector: ________________

Contractor: ____________________________ Contract No.: __________

You are hereby notified that ☐ tests ☐ inspection indicates that the __________________

____

does not conform to the Specifications requirements. The specification violated is

Section _________ Article/Paragraph _________. Under the provisions of the Technical

Specifications, the requirements are ______________________________________

____

____

Noncomplying work may be required to be removed and replaced at no cost to the ECC Trust.

It will be your responsibility to determine the corrective action necessary, and to determine whether you wish to discontinue operations until additional investigations by the ECC Trust's Engineer or Independent CQA Officer confirm or refute the initial findings.

____
Remedial Contractor Quality Control Manager

Noncompliance notice was received by the Resident Superintendent on ______________(date).

By: ____________________________ Title: ________________________

Distribution:
1. Independent CQA Officer
2. ECC Trust's Engineer
3. Site File

PROBLEM IDENTIFICATION AND CORRECTIVE ACTIONS REPORT

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Definable Work Feature: ____________________ Date: ____________________

Inspector: ____________________ Problem I.D. Number: __________

Contractor: ____________________ Reference Dwg. Nos.: __________

Foreman: ____________________

Description of Situation/Deficiency: Reported by: ____________________

Cause of Problem and Location:

Method and Time of Problem/Deficiency Recognition:

PROBLEM IDENTIFICATION AND CORRECTIVE ACTIONS REPORT
(Continuation Sheet)

Steps Taken/Proposed to Resolve Problem:

____
____
____
____
____
____
____
____

Solution:

____
____
____
____
____

Proposed By: ____________________ Accepted by: ____________________

Date: ____________________

Signature: ____________________ Signature: ____________________

Verification of Solution: ____________________

The problem stated above has been resolved according to the agreed upon solution.

	Remedial Design Project Engineer	Remedial CQC Manager	Independent CQA Officer	U.S. EPA Remedial Project Manager
Signature				
Title				
Date				

SUBMITTAL REGISTER

REGISTER NO. ____________

DATE REC'D.	TRANS-MITTAL NO.	SPECIFICATION IDENTIFICATION (ITEM NO.)	SPECIFICATION PARAGRAPH NUMBER		INDEPENDENT CQA OFFICER ACTION DATES		DESIGN ENGINEER ACTION DATES		REMARKS
					ITTED TO ENDENT QA ICER	ACTION	SUBMITTED TO DESIGN ENGINEER	ACTION	

DISTRIBUTIIIGN ENGINEER

RESIDENT SUPERINTENDENT'S DAILY REPORT

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________
REPORT NUMBER ____________________

Date: ____________

Day	S	M	T	W	TH	F	S

WEATHER	Bright Sun	Clear	Overcast	Rain	Snow
TEMP.	To 32	32-50	50-70	70-85	85 up
WIND	Still	Moder	High	Report No.	
HUMIDITY	Dry	Moder	Humid		

Average Field Force			
Name of Contractor	Non-manual	Manual	Remarks

Visitors			
Time	Representing	Representing	Remarks

Equipment at the Site: ____________________

Construction Activities: ____________________

By: ____________________ Title: ____________________

Distribution:
1. Independent CQA Officer
2. ECC Trust's Engineer
3. Site File

Page 1 of _____ Pages

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Date: ______________

REFERENCE DATA

Specification Section No.: ______ Page No.: ______ Paragraph No.: ______

Drawing No.: ______ Entitled: ______________________________

Sketch No.: ______ Dated: ______ Entitled: ______________________

DESCRIPTION

1. Detailed Identification of Problem or Reason for Change Request: ______________

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2. Detailed Solution Proposed or Accomplished: ________________________

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3. Is the Problem an Isolated Case or General? ________________________

4. Submit Sketches as Necessary.

By: ______________________ Title: ______________________

Approved By: ______________________

Distribution:
1. Independent CQA Officer
2. ECC Trust's Engineer
3. Remedial Design Project Manager

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

To: ____________________ Project: ____________________

____________________ ____________________

Date: ____________________ Our Job No.: ____________________

We are enclosing ________ copies of the following:

- ☐ Subcontract Agreement
- ☐ Shop Drawings
- ☐ List of Materials
- ☐ Plans
- ☐ Specifications
- ☐ Submittals List
- ☐ Daily Report
- ☐ Progress Report
- ☐ ____________________
- ☐ Photograph Data Sheet
- ☐ Report of Field Change
- ☐ Daily QC Report
- ☐ Non-Compliance Notification
- ☐ Final Certification
- ☐ For Your Use
- ☐ For Review and Comment
- ☐ For Approval

Remarks: ____

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Copies to: ____________________ By: ____________________

____________________ ____________________

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ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Date of Submittal: ___/___/___ Submittal Number ________
Approval or Disapproval By: ___/___/___
Previous Submittal Dates: ___/___/___ Resubmittal Number ________-A
___/___/___ Resubmittal Number ________-B
___/___/___ Resubmittal Number ________-C
___/___/___ Resubmittal Number ________-D

Title of Submittal: ____________________
Manufacturer: ____________________
Address: ____________________
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Supplier: ____________________
Address: ____________________
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Specification Reference Number: ____________________
Specification Reference Paragraph: ____________________
Specification Reference Drawing Number: ____________________

Comments (additional space on back of this sheet)

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Deviations (additional space on back of this sheet)

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Certification Statement
By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data and I have checked and coordinated each item with other applicable reviewed shop drawings and all contract requirements.

Items Included	Check with "X"
Plan/Narrative	
Shop Drawing(s)	
Catalog Cut/Mfgr Data	
Technical Data	
Test Report	
Certification	
Specifications	
Other:	

____
AWD Technologies, Inc.
Authorized Representative

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Date: ______________

Time Period Photographs Were Taken: ________________________________

Roll Number: ________ Frame Number: ________

General Description of Photographs: ________________________________

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Any Specific Items for the Record: ________________________________

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By: __________________________ Title: ________________________

Distribution:
1. ECC Trust's Engineer
2. Independent CQA Officer
3. Remedial Design Project Engineer

Page 1 of ____ Pages

RESIDENT SUPERINTENDENT'S PROGRESS REPORT

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Work Accomplished by Contractor (attach copies of appropriate supporting documentation such as invoices, contract documents, and photographs):

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Work Anticipated for Next Month: ______________________________

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Problems (including percentage of completion and unresolved delays encountered, or anticipated that may affect future schedule and description of efforts made to investigate delays):

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By: ______________________________
Remedial Contractor Resident Superintendent

Title: ______________________________
Remedial Contractor Quality Control Manager

Distribution:
1. Remedial Contractor Project Manager
2. ECC Trust's Engineer
3. Site File

RESIDENT SUPERINTENDENT'S
PROGRESS REPORT
(Continuation Sheet)

Work Accomplished by Contractor (Continued)

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By: _______________________________
Remedial Contractor Resident Superintendent

By: _______________________________
Remedial Contractor Quality Control Manager

Distribution:
1. Remedial Contractor Project Manager
2. ECC Trust's Engineer
3. Site File

Page _____ of _____ Pages

APPENDIX D

ASTM STANDARDS

Designation: C 31 – 90

Standard Practice for Making and Curing Concrete Test Specimens in the Field[1]

This standard is issued under the fixed designation C 31; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This practice has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This practice covers procedures for making and curing cylindrical and prismatic specimens using job concrete that can be consolidated by rodding or vibration as described herein.

1.2 The concrete used to make the molded specimens shall have the same levels of slump, air content, and percentage of coarse aggregate as the concrete being placed in the work.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 143 Test Method for Slump of Hydraulic Cement Concrete[2]

C 172 Method of Sampling Freshly Mixed Concrete[2]

C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method[2]

C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory[2]

C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method[2]

C 470 Specification for Molds for Forming Concrete Test Cylinders Vertically[2]

C 511 Specification for Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes[2]

C 617 Practice for Capping Cylindrical Concrete Specimens[2]

C 1064 Test Method for Temperature of Freshly Mixed Portland-Cement Concrete[2]

3. Significance and Use

3.1 This practice provides standardized requirements for making, curing, protecting, and transporting concrete test specimens under field conditions.

3.2 If specimen preparation is controlled as stipulated herein, the specimens may be used to develop information for the following purposes:

3.2.1 Checking the adequacy of mixture proportions for strength,

3.2.2 To serve as the basis for comparison with laboratory, field or in-place tests, as the basis for safety and in-structure performance evaluation, and as the basis for form and shoring removal time requirements,

3.2.3 Determination of compliance with strength specifications, and

3.2.4 Determination of time when a structure may be put in service.

4. Apparatus

4.1 *Molds, General*—Molds for specimens or fastenings thereto in contact with the concrete shall be made of steel, cast iron, or other nonabsorbent material, nonreactive with concrete containing portland or other hydraulic cements. Molds shall hold their dimensions and shape under conditions of severe use. Molds shall be watertight during use as judged by their ability to hold water poured into them. Provisions for tests of watertightness are given in Section 6 of Specification C 470. A suitable sealant, such as heavy grease, modeling clay, or microcrystalline wax shall be used where necessary to prevent leakage through the joints. Positive means shall be provided to hold base plates firmly to the molds. Molds shall be lightly coated with mineral oil or a suitable nonreactive form release material before use.

4.2 *Cylinder Molds:*

4.2.1 *Molds for Casting Specimens Vertically*—Molds for casting concrete test specimens shall conform to the requirements of Specification C 470.

4.3 *Beam Molds*—Beam molds shall be rectangular in shape and of the dimensions required to produce the specimens stipulated in 5.2. The inside surfaces of the molds shall be smooth. The sides, bottom, and ends shall be at right angles to each other and shall be straight and true and free of warpage. Maximum variation from the nominal cross section shall not exceed 1/8 in. (3.2 mm) for molds with depth or breadth of 6 in. (152 mm) or more. Molds shall produce specimens not more than 1/16 in. (1.6 mm) shorter than the required length in accordance with 5.2, but may exceed it by more than that amount.

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[1] This practice is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.03.01 on Methods of Testing Concrete for Strength.

Current edition approved March 30, 1990. Published May 1990. Originally published as C 31 – 20. Last previous edition C 31 – 88.

[2] *Annual Book of ASTM Standards*, Vol 04.02.

4.4 *Tamping Rod*—The rod shall be a round, straight steel rod ⅝ in. (16 mm) in diameter and approximately 24 in. (610 mm) long, with the tamping end rounded to a hemispherical tip of the same diameter. Both ends may be rounded, if preferred.

4.5 *Vibrators*—Internal vibrators may have rigid or flexible shafts, preferably powered by electric motors. The frequency or vibration shall be 7000 vibrations per minute or greater while in use. The outside diameter or side dimension of the vibrating element shall be at least 0.75 in. (19 mm) and not greater than 1.50 in. (38 mm). The combined length of the shaft and vibrating element shall exceed the maximum depth of the section being vibrated by at least 3 in. (76 mm). When external vibrators are used, they should be the table or plank type. The frequency of external vibrators shall be at least 3600 vibrations per minute. For both table and plank vibrators, provision shall be made for clamping the mold securely to the apparatus. A vibrating-reed tachometer should be used to check the frequency of vibration.

4.6 *Mallet*—A mallet with a rubber or rawhide head weighing 1.25 ± 0.50 lb (0.57 ± 0.23 kg) shall be used.

4.7 *Small Tools*—Tools and items which may be required are shovels, pails, trowels, wood float, metal float, blunted trowels, straightedge, feeler gage, scoops, and rules.

4.8 *Slump Apparatus*—The apparatus for measurement of slump shall conform to the requirements of Test Method C 143.

4.9 *Sampling and Mixing Receptacle*—The receptacle shall be a suitable heavy gage metal pan, wheelbarrow, or flat, clean nonabsorbent mixing board of sufficient capacity to allow easy remixing of the entire sample with a shovel or trowel.

4.10 *Air Content Apparatus*—The apparatus for measuring air content shall conform to the requirements of Test Methods C 173 or C 231.

5. Test Specimens

5.1 *Compressive Strength Specimens*—Compressive strength specimens shall be cylinders of concrete cast and hardened in an upright position, with a length equal to twice the diameter. The standard specimen shall be the 6 by 12-in. (152 by 305-mm) cylinder when the maximum size of the coarse aggregate does not exceed 2 in. (50 mm). When the maximum size of the coarse aggregate does exceed 2 in. (50 mm), either the concrete sample shall be treated by wet sieving as described in Method C 172 or the diameter of the cylinder shall be at least three times the nominal maximum size of coarse aggregate in the concrete. Unless required by the project specifications, cylinders smaller than 6 of 12 in. shall not be made in the field.

NOTE 1—The maximum size is the smallest sieve opening through which the entire amount of aggregate is required to pass.

5.2 *Flexural Strength Specimens*—Flexural strength specimens shall be rectangular beams of concrete cast and hardened with long axes horizontal. The length shall be at least 2 in. (50 mm) greater than three times the depth as tested. The ratio of width to depth as molded shall not exceed 1.5. The standard beam shall be 6 by 6 in. (152 by 152 mm) in cross section, and shall be used for concrete with maximum size coarse aggregate up to 2 in. (50 mm). When the nominal maximum size of the coarse aggregate exceeds 2 in. (50 mm), the smaller cross sectional dimension of the beam shall be at least three times the nominal maximum size of the coarse aggregate. Unless required by project specifications, beams made in the field shall not have a width or depth of less than 6 in.

6. Sampling Concrete

6.1 The samples used to fabricate test specimens under this standard shall be obtained in accordance with Method C 172 unless an alternative procedure has been approved.

6.2 Record the identity of the sample with respect to the location of the concrete represented and the time of casting.

7. Slump, Air Content, and Temperature

7.1 *Slump*—Measure the slump of each batch of concrete, from which specimens are made, immediately after remixing in the receptacle, as required in Test Method C 143.

7.2 *Air Content*—Determine the air content in accordance with either Test Method C 173 or Test Method C 231. The concrete used in performing the air content test shall not be used in fabricating test specimens.

7.3 *Temperature*—Determine the temperature in accordance with Test Method C 1064.

8. Molding Specimens

8.1 *Place of Molding*—Mold specimens promptly on a level, rigid surface, free of vibration and other disturbances, at a place as near as practicable to the location where they are to be stored.

8.2 *Placing the Concrete*—Place the concrete in the molds using a scoop, blunted trowel, or shovel. Select each scoopful, trowelful, or shovelful of concrete from the mixing pan to ensure that it is representative of the batch. Remix the concrete in the mixing pan with a shovel or trowel to prevent segregation during the molding of specimens. Move the scoop, trowel, or shovel around the perimeter of the mold opening when adding concrete to ensure an even distribution of the concrete and minimize segregation. Further distribute the concrete by use of a tamping rod prior to the start of consolidation. In placing the final layer the operator shall attempt to add an amount of concrete that will exactly fill the mold after compaction. Do not add nonrepresentative concrete to an underfilled mold.

8.2.1 *Number of Layers*—Make specimens in layers as indicated in Table 1.

8.3 *Consolidation:*

8.3.1 *Methods of Consolidation*—Preparation of satisfactory specimens requires different methods of consolidation. The methods of consolidation are rodding, and internal or external vibration. Base the selection of the method of consolidation on the slump, unless the method is stated in the specifications under which the work is being performed. Rod concretes with a slump greater than 3 in. (75 mm). Rod or vibrate concretes with slump of 1 to 3 in. (25 to 75 mm). Vibrate concretes with slump of less than 1 in. (25 mm). Concretes of such low water content that they cannot be properly consolidated by the methods described herein, or requiring other sizes and shapes of specimens to represent the product or structure, are not covered by this method. Specimens for such concretes shall be made in accordance with the requirements of Practice C 192 with regard to

TABLE 1 Number of Layers Required for Specimens

Specimen Type and Size, as Depth, in. (mm)	Mode of Compaction	Number of Layers	Approximate Depth of Layer, in. (mm)
Cylinders:			
12 (305)	rodding	3 equal	4 (100)
Over 12 (305)	rodding	as required	4 (100)
12 (305) to 18 (460)	vibration	2 equal	half depth of specimens
Over 18 (460)	vibration	3 or more	8 (200) as near as practicable
Beams:			
6 (152) to 8 (200)	rodding	2 equal	half depth of specimen
Over 8 (200)	rodding	3 or more	4 (100)
6 (152) to 8 (200)	vibration	1	depth of specimen
Over 8 (200)	vibration	2 or more	8 (200) as near as practicable

TABLE 2 Number of Roddings to be Used in Molding Cylinder Specimens

Diameter of Cylinder, in. (mm)	Number of Strokes/Layer
6 (152)	25
8 (200)	50
10 (250)	75

specimen size and shape and method of consolidation.

8.3.2 *Rodding*—Place the concrete in the mold, in the required number of layers of approximately equal volume. For cylinders, rod each layer with the rounded end of the rod using the number of strokes specified in Table 2. The number of roddings per layer required for beams is one for each 2-in.^{2} (13-cm^2) top surface area of the specimen. Rod the bottom layer throughout its depth. Distribute the strokes uniformly over the cross section of the mold and for each upper layer allow the rod to penetrate about ½ in. (12 mm) into the underlying layer when the depth of the layer is less than 4 in. (100 mm), and about 1 in. (25 mm) when the depth is 4 in. or more. After each layer is rodded, tap the outsides of the mold lightly 10 to 15 times with the mallet, to close any holes left by rodding and to release any large air bubbles that may have been trapped. Use an open hand to tap light-gage single-use molds which are susceptible to damage if tapped with a mallet. After tapping, spade the concrete along the sides and ends of beam molds with a trowel or other suitable tool.

8.3.3 *Vibration*—Maintain a uniform time period for duration of vibration for the particular kind of concrete, vibrator, and specimen mold involved. The duration of vibration required will depend upon the workability of the concrete and the effectiveness of the vibrator. Usually sufficient vibration has been applied as soon as the surface of the concrete has become relatively smooth. Continue vibration only long enough to achieve proper consolidation of the concrete. Overvibration may cause segregation. Fill the molds and vibrate in the required number of approximately equal layers. Place all the concrete for each layer in the mold before starting vibration of that layer. When placing the final layer, avoid overfilling by more than ¼ in. (6 mm). Finish the surface either during or after vibration where external vibration is used. Finish the surface after vibration when internal vibration is used. When the finish is applied after vibration, add only enough concrete with a trowel to overfill the mold about ⅛ in. (3 mm). Work it into the surface and then strike it off.

8.3.3.1 *Internal Vibration*—The diameter of the vibrating element, or thickness of a square vibrating element, shall be in accordance with the requirements of 4.5. For beams, the vibrating element shall not exceed ⅓ of the width of the mold. For cylinders, the ratio of the diameter of the cylinder to the diameter of the vibrating element shall be 4.0 or higher. In compacting the specimen the vibrator shall not be allowed to rest on the bottom or sides of the mold. Carefully withdraw the vibrator in such a manner that no air pockets are left in the specimen.

8.3.3.2 *Cylinders*—Use three insertions of the vibrator at different points for each layer. Allow the vibrator to penetrate through the layer being vibrated, and into the layer below, approximately 1 in. (25 mm). After each layer is vibrated, tap the outsides of the mold lightly 10 to 15 times with the mallet, to close any holes that remain and to release any large air bubbles that may have been trapped. Use an open hand to tap light-gage single-use molds which are susceptible to damage if tapped with a mallet.

8.3.3.3 *Beam*—Insert the vibrator at intervals not exceeding 6 in. (150 mm) along the center line of the long dimension of the specimen. For specimens wider than 6 in., use alternating insertions along two lines. Allow the shaft of the vibrator to penetrate into the bottom layer approximately 1 in. (25 mm). After each layer is vibrated, tap the outsides of the mold lightly 10 to 15 times with the mallet to close any holes left by vibrating and to release any large air bubbles that may have been trapped.

8.3.4 *External Vibration*—When external vibration is used, take care to ensure that the mold is rigidly attached to or securely held against the vibrating element or vibrating surface.

8.4 *Finishing*—After consolidation, unless the finishing has been performed during the vibration (8.3.3), strike off the surface of the concrete and float or trowel it as required. Perform all finishing with the minimum manipulation necessary to produce a flat even surface that is level with the rim or edge of the mold and that has no depressions or projections larger than ⅛ in. (3.2 mm).

8.4.1 *Cylinders*—After consolidation, finish the top surfaces by striking them off with the tamping rod where the consistency of the concrete permits or with a wood float or trowel. If desired, cap the top surface of freshly made cylinders with a thin layer of stiff portland cement paste which is permitted to harden and cure with the specimen. See section on Capping Materials of Practice C 617.

8.4.2 *Beams*—After consolidation of the concrete, strike off the top surface to the required tolerance to produce a flat even surface. A wood float may be used.

8.5 *Initial Storage*—Immediately after being struck off, the specimens shall be moved to the storage place where they will remain undisturbed for the initial curing period. If specimens made in single use mold are moved, lift and support the specimens from the bottom of the molds with a large trowel or similar device.

9. Curing

9.1 *Covering After Finishing*—Immediately after finishing, precautions shall be taken to prevent evaporation and loss of water from the specimens. Protect the outside surfaces of cardboard molds from contact with wet burlap or other sources of water. Cardboard molds may expand and damage specimens at an early age if the outside of the mold absorbs water. Cover specimens with a nonabsorbent, nonreactive plate or sheet of impervious plastic. Wet burlap may be used over the plate or plastic sheet to help retard evaporation, but the burlap must not be in contact with the surface of the concrete.

9.2 *Curing Specimens for Checking the Adequacy of Mixture Proportions for Strength or as the Basis for Acceptance or Quality Control:*

9.2.1 *Initial Curing:*

9.2.1.1 *Initial Curing in Air*—During the initial 24 ± 8 h after molding, the temperature immediately adjacent to the specimens shall be maintained in the range of 60 to 80°F (16 to 27°C), and loss of moisture from the specimens shall be prevented (Note 2). Temperature differentials in and between specimens shall be controlled by shielding from the direct rays of the sun and from radiant heating devices. Specimens not to be transported shall be removed from the molds after the initial 24 ± 8 h and standard curing shall be started as required by 9.2.2. Specimens to be transported prior to 48 h after molding shall not be demolded, but shall continue initial curing at 60 to 80°F (16 to 27°C) until time for transporting. Specimens to be transported after 48-h age shall be demolded in 24 ± 8 h. Curing shall then be continued but in saturated limewater at 73.4 ± 3°F (23 ± 1.7°C) until the time of transporting.

NOTE 2—It may be necessary to create an environment during the initial curing in air period to provide satisfactory moisture conditions and to control the temperature in the range of 60 to 80°F (16 to 27°C). The specimens may be stored in tightly constructed wooden boxes, damp sand pits, temporary buildings at construction sites, under wet burlap in favorable weather or in heavyweight closed plastic bags, or use other suitable methods, provided the foregoing requirements limiting specimen temperature and moisture loss are met. The temperature may be controlled by ventilation, or thermostatically controlled cooling devices, or by heating devices such as stoves, light bulbs or thermostatically controlled heating elements. Temperature record of the specimens may be established by means of maximum-minimum thermometers.

9.2.1.2 *Initial Curing of Cylinders in Water*—Immediately after molding, immerse the specimens in saturated limewater at 60 to 80°F (16 to 27°C) for 24 ± 8 h. This curing is not acceptable for specimens in cardboard molds or molds which expand when immersed in water. Remove specimens from molds at 24 ± 8 h, protect from loss of moisture, and within 30 min start standard curing at 73.4 ± 3°F (23 ± 1.7°C) as required in 9.2.2.

9.2.2 *Standard Curing:*

9.2.2.1 *Cylinders*—Upon completion of initial curing and within 30 min after removing the molds, store specimens in a moist condition with free water maintained on their surfaces at all times at a temperature of 73.4 ± 3°F (23 ± 1.7°C). Temperatures between 68 and 86°F (20 and 30°C) are permitted for a period not to exceed 3 h immediately prior to test if free moisture is maintained on the surfaces of the specimen at all times, except when capping with sulfur mortar capping compound. When capping with this material, the ends of the cylinder will be dried as described in Practice C 617. Specimens shall not be exposed to dripping or running water. The required moist storage can be obtained by immersion in saturated limewater and may be obtained by storage in a moist room or cabinet meeting the requirements of Specification C 511.

9.2.2.2 *Beams*—Beams are to be cured the same as cylinders (see 9.2.2.1) except for a minimum of 20 h prior to testing, they shall be stored in saturated limewater at 73.4 ± 3°F (23 ± 1.7°C). Drying of the surfaces of the beam shall be prevented between removal from limewater and completion of testing.

NOTE 3—Relatively small amounts of surface drying of flexural specimens can induce tensile stresses in the extreme fibers that will markedly reduce the indicated flexural strength.

9.3 *Curing for Determining Form Removal Time or When a Structure May be Put into Service:*

9.3.1 *Cylinders*—Store cylinders in or on the structure as near to the point of deposit of the concrete represented as possible. Protect all surfaces of the cylinders from the elements in as near as possible the same way as the formed work. Provide the cylinders with the same temperature and moisture environment as the structural work. Test the specimens in the moisture condition resulting from the specified curing treatment. To meet these conditions, specimens made for the purpose of determining when a structure may be put in service shall be removed from the molds at the time of removal of form work.

9.3.2 *Beams*—As nearly as practicable, cure beams in the same manner as the concrete in the structure. At the end of 48 ± 4 h after molding, take the molded specimens to the storage location and remove from the molds. Store specimens representing pavements of slabs on grade by placing them on the ground as molded, with their top surfaces up. Bank the sides and ends of the specimens with earth or sand that shall be kept damp, leaving the top surfaces exposed to the specified curing treatment. Store specimens representing structure concrete as near the point in the structure they represent as possible, and afford them the same temperature protection and moisture environment as the structure. At the end of the curing period leave the specimens in place exposed to the weather in the same manner as the structure. Remove all beam specimens from field storage and store in limewater at 73.4 ± 3°F (23 ± 1.7°C) for 24 ± 4 h immediately before time of testing to ensure uniform moisture condition from specimen to specimen. Observe the precautions given in 9.2.2.2 to guard against drying between time of removal from curing to testing.

10. Transportation of Specimens to Laboratory

10.1 Specimens shall not be transported from the field to the laboratory before completion of the initial curing. Specimens to be transported prior to an age of 48 h shall not be demolded prior to completion of transportation. Prior to transporting, specimens shall be cured and protected as required in Section 9. During transportation, the specimens must be protected with suitable cushioning material to prevent damage from jarring and from freezing temperatures, or moisture loss. Moisture loss may be prevented by wrapping the specimens in plastic or surrounding them with wet sand or wet saw dust. When specimens are received by the laboratory, they shall be removed from molds if not done before shipment and placed in the required standard curing at 73.4 ± 3°F (23 ± 1.7°C).

Standard Test Method for Slump of Hydraulic Cement Concrete[1]

This standard is issued under the fixed designation C 143; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This method has been approved for use by agencies of the Department of Defense. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 This test method covers determination of slump of concrete, both in the laboratory and in the field.

1.2 The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units may be approximate.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Document

2.1 *ASTM Standard:*

C 172 Method of Sampling Freshly Mixed Concrete[2]

3. Summary of Test Method

3.1 A sample of freshly mixed concrete is placed and compacted by rodding in a mold shaped as the frustum of a cone. The mold is raised, and the concrete allowed to subside. The distance between the original and displaced position of the center of the top surface of the concrete is measured and reported as the slump of the concrete.

4. Apparatus

4.1 *Mold*—The test specimen shall be formed in a mold made of metal not readily attacked by the cement paste. The metal shall not be thinner than No. 16 gage (BWG) and if formed by the spinning process, there shall be no point on the mold at which the thickness is less than 0.045 in. (1.14 mm). The mold shall be in the form of the lateral surface of the frustum of a cone with the base 8 in. (203 mm) in diameter, the top 4 in. (102 mm) in diameter, and the height 12 in. (305 mm). Individual diameters and heights shall be within ±⅛ in. (3.2 mm) of the prescribed dimensions. The base and the top shall be open and parallel to each other and at right angles to the axis of the cone. The mold shall be provided with foot pieces and handles similar to those shown in Fig. 1. The mold may be constructed either with or without a seam. When a seam is required, it should be essentially as shown in Fig. 1. The interior of the mold shall be relatively smooth and free from projections such as protruding rivets. The mold shall be free from dents. A mold which clamps to a nonabsorbent base plate is acceptable instead of the one illustrated provided the clamping arrangement is such that it can be fully released without movement of the mold.

4.2 *Tamping Rod*—The tamping rod shall be a round, straight steel rod ⅝ in. (16 mm) in diameter and approximately 24 in. (600 mm) in length, having the tamping end rounded to a hemispherical tip the diameter of which is ⅝ in.

5. Sample

5.1 The sample of concrete from which test specimens are made shall be representative of the entire batch. It shall be obtained in accordance with Method C 172.

6. Procedure

6.1 Dampen the mold and place it on a flat, moist, nonabsorbent (rigid) surface. It shall be held firmly in place during filling by the operator standing on the two foot pieces. From the sample of concrete obtained in accordance with Section 5, immediately fill the mold in three layers, each approximately one third the volume of the mold.

NOTE 1—One third of the volume of the slump mold fills it to a depth of 2⅝ in. (67 mm); two thirds of the volume fills it to a depth of 6⅛ in. (155 mm).

6.2 Rod each layer with 25 strokes of the tamping rod. Uniformly distribute the strokes over the cross section of each layer. For the bottom layer this will necessitate inclining the rod slightly and making approximately half of the strokes near the perimeter, and then progressing with vertical strokes spirally toward the center. Rod the bottom layer throughout its depth. Rod the second layer and the top layer each throughout its depth, so that the strokes just penetrate into the underlying layer.

6.3 In filling and rodding the top layer, heap the concrete above the mold before rodding is started. If the rodding operation results in subsidence of the concrete below the top edge of the mold, add additional concrete to keep an excess of concrete above the top of the mold at all times. After the top layer has been rodded, strike off the surface of the concrete by means of a screeding and rolling motion of the tamping rod. Remove the mold immediately from the concrete by raising it carefully in a vertical direction. Raise the mold a distance of 12 in. (300 mm) in 5 ± 2 s by a steady upward lift with no lateral or torsional motion. Complete the entire test from the start of the filling through removal of the mold without interruption and complete it within an elapsed time of 2½ min.

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[1] This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.03.03 on Methods of Testing Fresh Concrete.

Current edition approved March 30, 1990. Published May 1990. Originally published as D 138 – 22 T. Last previous edition C 143 – 89a.

[2] *Annual Book of ASTM Standards*, Vol 04.02.

6.4 Immediately measure the slump by determining the vertical difference between the top of the mold and the displaced original center of the top surface of the specimen. If a decided falling away or shearing off of concrete from one side or portion of the mass occurs (Note 2), disregard the test and make a new test on another portion of the sample.

NOTE 2—If two consecutive tests on a sample of concrete show a falling away or shearing off of a portion of the concrete from the mass of the specimen, the concrete probably lacks necessary plasticity and cohesiveness for the slump test to be applicable.

7. Report

7.1 Record the slump in terms of inches (millimetres) to the nearest ¼ in. (6 mm) of subsidence of the specimen during the test as follows:

Slump = 12 − inches of height after subsidence

8. Precision and Bias

8.1 *Precision*

8.1.1 *Interlaboratory Test Method*—No interlaboratory test program has been run on this test method. Since it is not possible to provide equivalent concretes at various test sites free of errors from sources other than the slump measurement, a multilaboratory precision statement would not be meaningful.

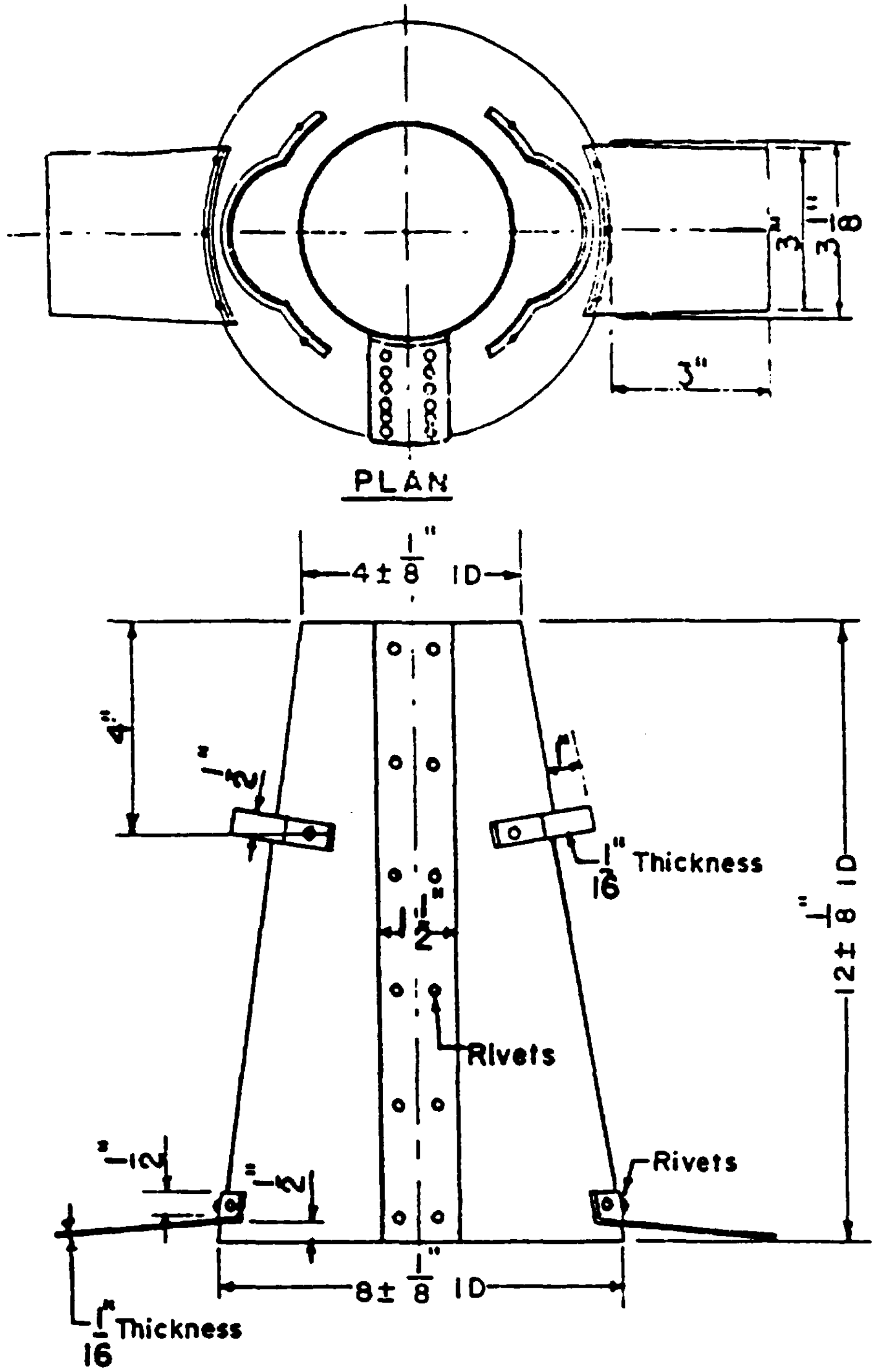
8.1.2 *Multi-Operator Test Results*—Extensive field data[3] allow a statement regarding the multi-operator precision of this test method.

Test range	1.5 to 2.76 in. (38 to 70 mm)
Total number of samples	2304
Pooled Repeatability Standard deviation (1S)	0.30 in. (8 mm)
95 % Repeatability Limit (D2S)	0.83 in. (21 mm)

Therefore, results of two properly conducted tests by different operators in the same laboratory on the same material should not differ by more than 0.83 in. (21 mm). Due to the limited slump range in the concrete used in this test program, caution should be exercised in applying these precision values.

8.2 *Bias*—This test method has no bias since slump is defined only in terms of this test method.

[3] Baker, W. M., and McMahon, T. F., "Quality Assurance of Portland Cement Concrete," *Public Roads*, Vol 35, No. 8, 1969.



Metric Equivalents

in.	1/16	1/8	1/2	1	1½	3	3⅛	4	8	12
mm	1.6	3.2	12.7	25.4	38.1	76.2	79.4	102	203	305

FIG. 1 Mold for Slump Test

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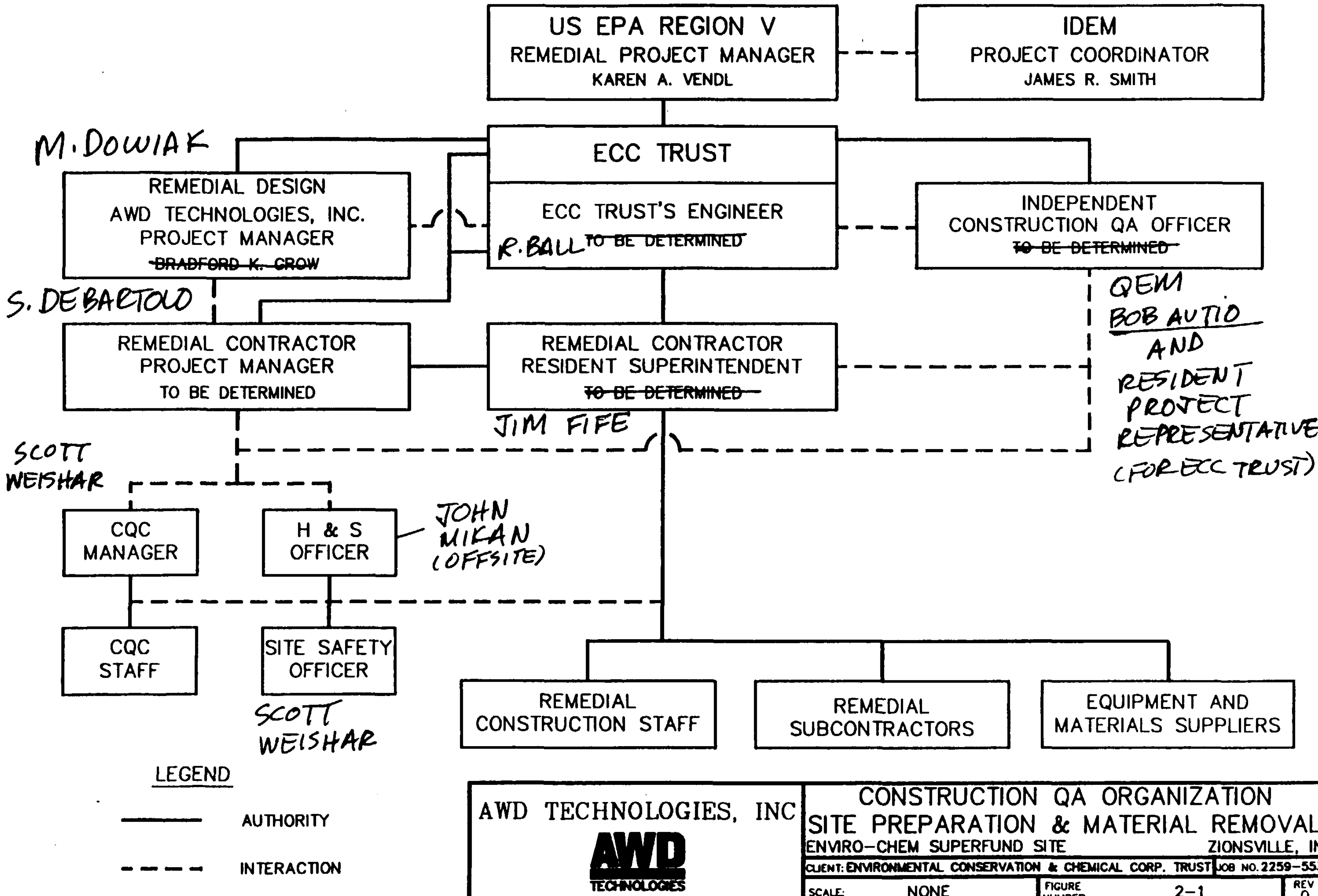

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AWD TECHNOLOGIES, INC

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CONSTRUCTION QA ORGANIZATION
SITE PREPARATION & MATERIAL REMOVAL
ENVIRO-CHEM SUPERFUND SITE ZIONSVILLE, IN

CLIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST		JOB NO. 2259-553	
SCALE: NONE	FIGURE NUMBER 2-1		REV 0

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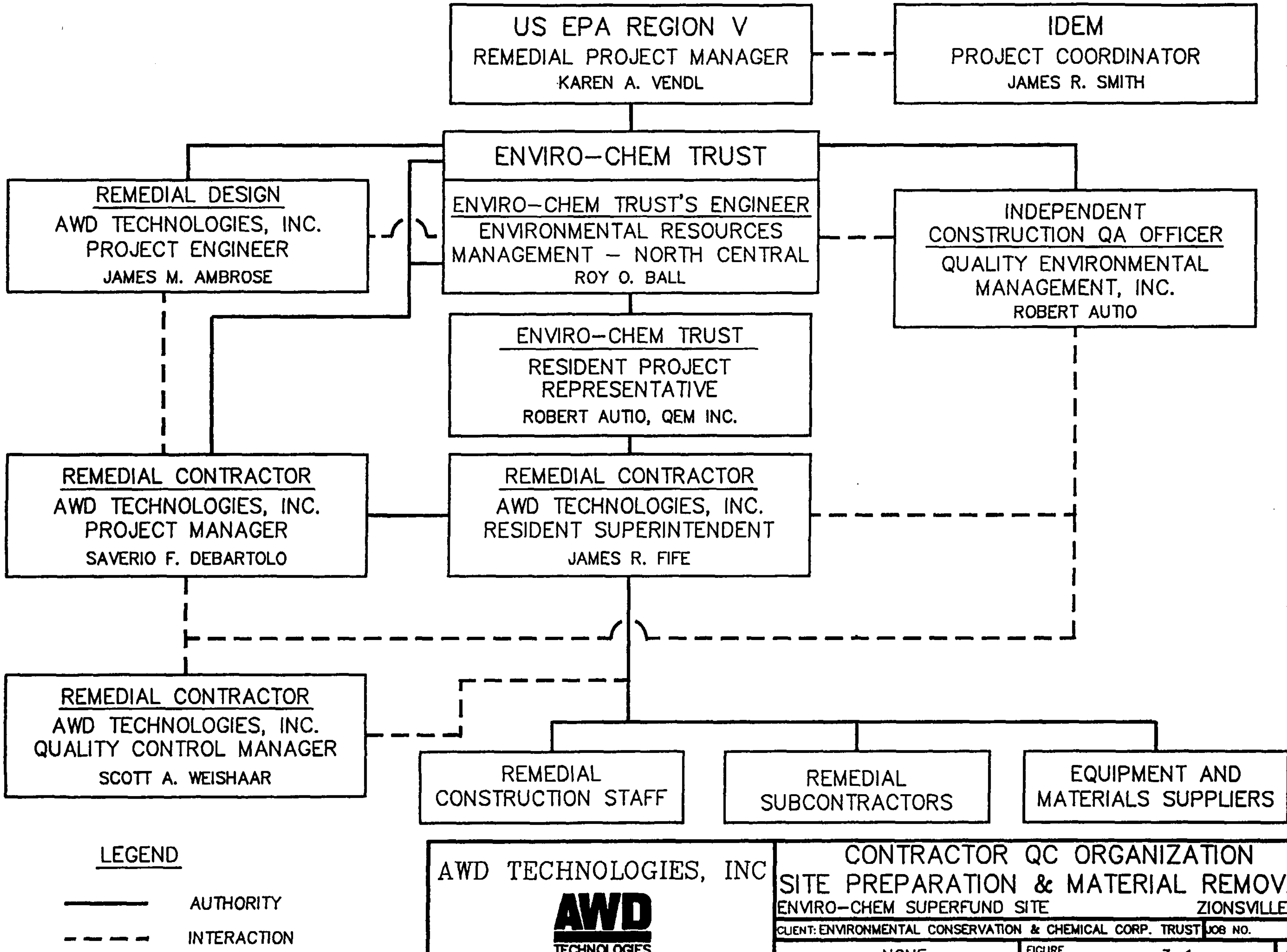

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	CLIENT: ENVIRONMENTAL CONSERVATION & CHEMICAL CORP. TRUST — JOB NO.
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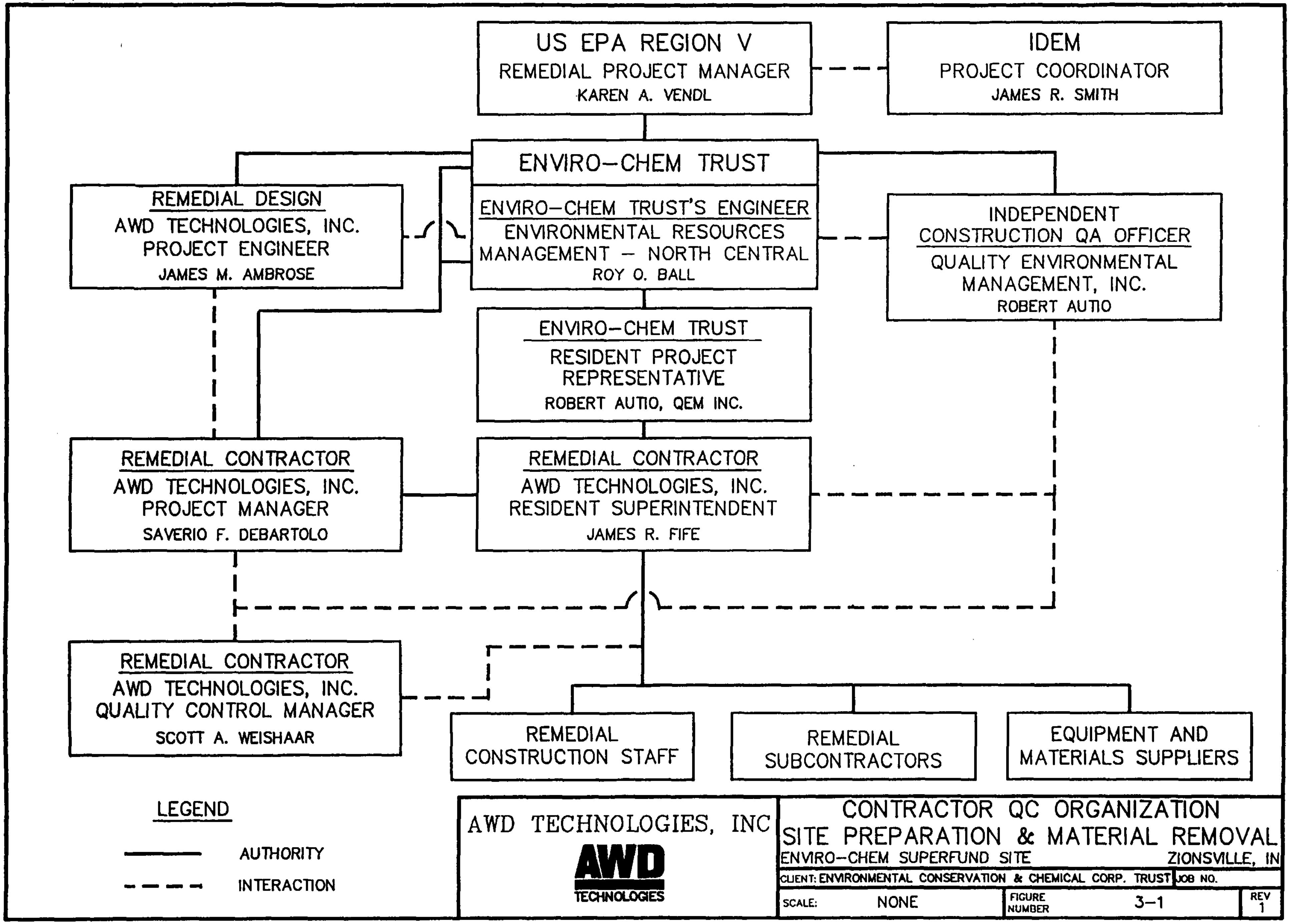

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SUBMITTAL FORM
PAGE 1 OF 1

ECC SITE
ZIONSVILLE, INDIANA
PROJECT NUMBER ____________________

Date of Submittal: 8 / 17 / 93 Submittal Number SPMR-034
Approval or Disapproval By: ___/___/___
Previous Submittal Dates: ___/___/___ Resubmittal Number -A
___/___/___ Resubmittal Number -B
___/___/___ Resubmittal Number -C
___/___/___ Resubmittal Number -D

Title of Submittal: Contractor Quality Control
Manufacturer:
Address:

Supplier:
Address:

Specification Reference Number:
Specification Reference Paragraph:
Specification Reference Drawing Number:

Comments (additional space on back of this sheet)
Contractor Organization — One Page Addition

Deviations (additional space on back of this sheet)

Certification Statement
By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data and I have checked and coordinated each item with other applicable reviewed shop drawings and all contract requirements.

Items Included	Check with "X"
Plan/Narrative	
Shop Drawing(s)	
Catalog Cut/Mfgr Data	
Technical Data	
Test Report	
Certification	
Specifications	
Other:	* UPDATE Page

J R Fife
AWD Technologies, Inc.
Authorized Representative